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WHEAT VARIETY TRIALS.

I. THOMAS Superintendent of Wheat Farming and E. R. WATSON—Agricultural Adviser.

EACH year wheat variety trials are conducted on the wheatbelt Agricultural Research Stations to determine the varieties which can be recommended as being the most suitable for planting under West Australian conditions. Included in these trials are varieties introduced from other parts of Australia as well as the more promising crossbred varieties produced at the Research Stations in this State which have proved satisfactory in other respects.

Of all varieties grown in Western Australia, over 60 per cent. of the total area planted to wheat in 1947 was sown to varieties produced by this Department, and over 50 per cent. of the total area was represented by the varieties Bencubbin and Bungulla. These two are the standard recommended varieties and are used for comparison in all Research Station Wheat Variety Trials.

Prior to the inclusion of the crossbred varieties in these field yield trials they undergo various tests for disease resistance etc. and are placed in small scale or micro yield trials which sometimes include up to 200 crossbred and control varieties. Such small scale trials are a convenient method of eliminating crossbreds of lesser value with a minimum of seed requirements, and thus only the more promising are included in the field trials.

SEASONAL CONDITIONS.

Seasonal conditions throughout the wheatbelt varied considerably during 1948, and the following is a brief summary of the conditions experienced at each of the Research Stations:—

Avondale.—Very little rain was recorded before the month of June and consequently seeding operations were much later than usual. Despite the lateness of the opening rains 1,183 points were recorded for the growing period, which compares favourably with the average rainfall. There were heavy falls registered during the months of June, July, August and September with lighter falls in October and November. Most crops finished off reasonably well.

Chapman.—Rainfall throughout the year was very light and well below the average for each month, only 787 points were recorded for the growing period, compared with an average of 1,542 points. No rain was recorded in May and only about half the average rainfall registered for June.

Merredin.—Following upon a good heavy rain at the end of April which allowed the fallow to be worked into good condition, no appreciable rains were recorded until the 6th June. Comparatively dry conditions were experienced during the remainder of the growing period and these together with the hot dry winds experienced in September and October caused severe setbacks to the crops. Good falls were recorded late in September, but they were too late to be of much benefit to the crops generally.

Salmon Gums.—Early rains recorded in February enabled the fallow to be worked into good condition. Following upon a good fall in April no appreciable rains were experienced until early June. Good falls were recorded in June, July and August and later falls in October resulted in quite good yields being obtained.

Wongan Hills.—Following upon the good rainfall registered in April no rain at all was recorded for the month of May; however, rainfall for the remainder of the growing period was satisfactory, except perhaps for October, when only 19 points were recorded, and crops generally made good growth.

Details of the rainfall recorded at each of the Research Stations are given in Table No. 1.

Station.	Year.	Jan	Feb	Mar	Apl	Growing Period Rainfall							Nov.	Dec	Annual Total
						May	June	July.	Aug	Sept	Oct	Total			
Avondale	1948			71	35	6	385	214	246	249	83	1,183	63	9	1,361
Average	22 years	23	34	101	79	217	337	308	240	106	80	1,288	53	31	1,609
Chapman	1948			34	105		257	220	198	97	15	787	46		972
Average	43 years	26	38	66	75	230	425	389	262	144	88	1,538	39	25	1,807
Merredin	1948	28	11	56	161	4	189	204	192	102	38	720	33	16	1,034
Average	37 years	42	53	95	90	136	196	185	153	81	75	826	42	55	1,203
Salmon Gums	1948		417	30	120	9	152	137	112	51	105	566	141	9	1,283
Average	23 years	80	87	139	93	121	151	142	146	91	112	763	91	76	1,329
Wongan Hills	1948	1	5	140	187		175	290	370	104	19	958	83	8	1,382
Average	23 years	33	45	96	96	187	270	261	208	91	70	1,087	45	40	1,442

DISEASE RESISTANCE.

As mentioned earlier in this article crossbred varieties are subjected to disease resistance tests in the earlier stages of selection as a variety is not considered to be valuable no matter what its inherent yielding capacity may be, unless it is capable of yielding satisfactorily under varying seasonal conditions and disease epidemics.

Flag smut.—All crossbred material as well as introduced varieties are subjected to flag smut tests whereby an actual epidemic of the disease is encouraged by inoculating the seed with flag smut spores prior to sowing. Resistance to flag smut is possessed by most varieties now being released by Australian plant breeders.

Stem rust.—Although fortunately this State is not subject to severe rust epidemics as frequently as the Eastern States, nevertheless the losses incurred in the two most recent epidemics of 1934 and 1943 were sufficient to warrant the endeavours to produce rust resistant varieties capable of yielding equally as well as the standard varieties which lack rust resistance. Only minor incidences of rust were reported in this State in 1948. As yet the biotype of rust race 34 which has now been isolated in each of the three Eastern States, New South Wales, Victoria and South Australia, has not been definitely recorded in this State, although it is anticipated that it will eventually be recorded here. Until such time as it is Eureka and other varieties deriving their rust resistance from the same source, e.g., Frisco and Wongoondy, may be regarded as rust resistant in this State. In the Eastern States where the biotype has been recorded they can no longer be regarded as resistant, and farmers look for varieties with either Kenya C6041, Kenya C6042 or mature plant type of resistance as described in Vol. XXV of this Journal, March, 1948. Such varieties include Dowerin, Charter, Yalta, Gabo, Kendee and those possessing the mature plant type of resistance, such as Celebration, Hofed, Febweb and Warigo.

Field day at the Wongan Hills Research Station The farm manager, Mr. D R. Bateman, explaining the layout of the wheat variety trials

FLOUR STRENGTH.

A comprehensive description on flour strength and environment has been included in a previous article in this Journal, Vol. XXIV, March, 1947, pages 33 to 38. It is sufficient to repeat that one of the primary objectives in the wheat breeding programme of this Department is to raise the strength level of Western Australian wheat. An important point is that flour strength is directly related to soil fertility. Even though a variety has the inherent characteristic to produce flour of good baking quality unless the farmer maintains the fertility of his heavier land and builds up the fertility of the lighter soil types by the use of suitable legumes such as subterranean clover, peas, lupins, vetches, etc., it does not have the opportunity of expressing the true value of its grain quality.

FIELD TRIALS.

Rust resistant varieties produced in other States as well as several promising crossbreds from the Merredin Research Station were included in the 1948 trials. The results of the wheat variety trials carried out in that year are tabulated in Table No. 2.

TABLE II.

WHEAT VARIETY TRIALS AT RESEARCH STATIONS, 1948-1949 SEASON.

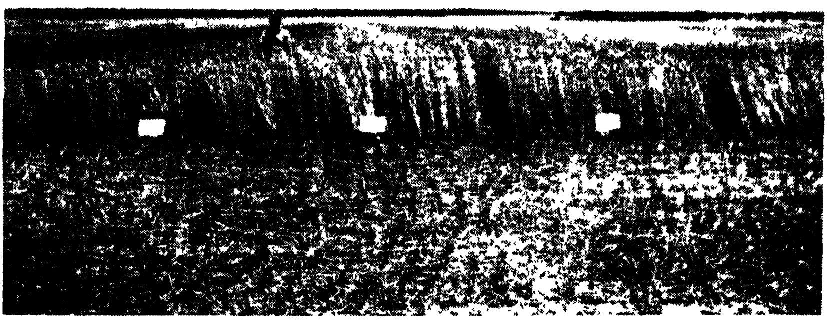
	Avondale.			Chapman.			Merredin.			Salmon Gums.			Wongan Hills.		
	Yield.	Percentage of Control.		Yield.	Percentage of Control		Yield.	Percentage of Control.		Yield.	Percentage of Control.		Yield.	Percentage of Control.	
		1948.	Average*		1948.	Average*		1948.	Average*		1948.	Average*		1948.	Average*
EARLY MAY TRIAL.															
	Bus. lb.	%	%	Bus. lb.	%	%	Bus. lb.	%	%	Bus lb.	%	%	Bus lb.	%	%
Bencubbin	27 38	100	100	11 14	100	100	10 29	100	100	12 20	100	100	9 11	100	100
Eureka	28 29	103	(5) 104	13 46	123	(5) 94	10 18	98	(5) 80	11 42	95	(5) 83	7 9	78	(4) 85
Kondut	30 27	110	(5) 105	12 19	110	(5) 97	5 33	53	(5) 70	11 42	95	(5) 86	7 12	78	(4) 83
Yalta	26 45	97	(2) 89	12 48	114	(3) 95	11 23	108		10 46	87		6 42	73	
Celebration	27 20	99		10 31	94	(2) 88	7 1	67		10 22	84		6 3	66	
M.70 (Sword x Kenya)	20 13	73		12 31	111		10 31	100		11 2	89		6 43	73	
Difference for Significance P = ± .05	4 2	15		0 37	5		1 18	12		0 45	6		0 55	10	
LATE MAY TRIALS.															
SECTION I.															
Bungulla	23 44	100	100	20 51	100	100	16 34	100	100	14 18	100	100	8 23	100	100
Koorda				16 59	82	(4) 83	15 12	92	(4) 68	14 24	101	(4) 93	10 26	124	(4) 91
Frisco				18 21	88	(2) 92	17 30	106	(2) 104				9 55	118	(2) 89
Gabo	24 35	103	(2) 124	19 59	96	(2) 99	18 24	111	(3) 91	14 56	104	(2) 101	9 51	118	(2) 95
Kendee	22 37	95	(2) 117	16 21	78	(2) 93	14 43	89	(3) 84	15 16	107	(2) 102	8 58	107	(2) 91
Wongoondy	26 29	112	(3) 123							14 22	100	(3) 102			
Dowerin	24 3	101	(2) 113									...			..
Charter	21 47	92	(4) 95							12 48	90	(4) 91			
M.77	27 57	118								14 22	100	(3) 98			
Difference for Significance P = ± .05	2 28	10		0 38	3		1 2	6		1 24	10	..	1 21	16	
SECTION II.															
Bungulla				21 47	100	100	19 39	100	100				9 31	100	100
Charter				18 26	85	(3) 90	16 3	82	(5) 86				9 17	97	(3) 79
Dowerin				17 14	79	(3) 93	15 25	78	(3) 88				7 9	75	
Wongoondy				19 47	91	(3) 97	18 35	96	(3) 106				8 10	86	(3) 88
M.77				20 34	94	(3) 111	20 3	102	(3) 106				9 12	97	(3) 90
M.88							17 15	87							
M.90							18 13	92							
Difference for Significance P = ± .05				2 6	10		0 52	5					1 2	11	

* Number of trials indicated in parentheses.

NEW VARIETIES.

Although no further new varieties have been grown in the trials this year there are a number of Eastern States varieties included which have been introduced during the past few years, and the notes concerning these varieties which have been included in previous articles are represented in view of the possible importance of these varieties in this State. Notes concerning the two more recent new varieties produced by this Department, Dowerin and Wongoondy, are also included.

Celebration.—Produced by the New South Wales Department of Agriculture it is highly resistant to flag smut and stem rust, including the biotype of rust race 34 to which Eureka is susceptible. It has a mature plant type of resistance. The grain quality is good, being in the premium class, but results from the 1948 trials indicate that it has only average yielding ability under Western Australian conditions.



Portion of a Wheat Variety Trial—Merredin Research Station
Each plot is one-eighth of an acre and is replicated five times in randomized blocks

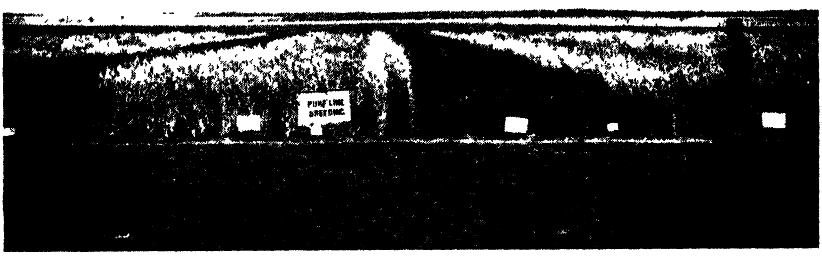
Frisco.—Bred by the New South Wales Department of Agriculture this early mid-season wheat derives its rust resistance from Eureka and therefore is susceptible to the Eureka attacking biotype of rust. It produces a grain of good quality and yields from the variety trials so far have been promising.

Gabo.—This is an early maturing wheat bred at the Sydney University. It is highly resistant to all races of stem rust known to occur in Australia, but is susceptible to flag smut. It has short strong straw and in the Eastern States has maintained high milling and baking quality when grown in differing climatic conditions. The results from trials conducted in Western Australia so far indicate that it is an early maturing variety especially suitable to the higher rainfall areas as it appears to need good finishing conditions to yield consistently well.

Kendee.—Kenya x Dundee—A mid-season maturing wheat bred at Sydney University and having the Kenya C.6042 type of rust resistance with a resistance to all known races of stem rust in Australia. It has strong straw and the grain

produces a medium strong flour under favourable conditions. Yields in Western Australian trials so far have been satisfactory, especially under higher rainfall conditions.

Yalta.—This midseason maturing variety bred by the New South Wales Department of Agriculture has a rust resistance similar to Kendee and is resistant to all known races of stem rust in Australia. The straw is of medium height, stands well and the baking quality of the grain is in the premium class. It is highly resistant, but not immune to flag smut. It was included in the variety trials for the first time in 1947, but due to poor germination caused by treatment to which the seed was subjected for the control of loose smut results for that year could not be regarded as reliable. However the 1948 results confirm the opinion that the variety will be a very suitable one for replacing Eureka as a midseason variety. A limited quantity of seed of this variety is now being distributed to farmers by this Department.



The initial step in the production of pedigree seed is the maintenance of a "pure line" which serves to keep varieties breeding true for the varietal characteristics.

Wongoondy.—This variety which was selected at the Merredin Research Station from a cross between Eureka and Bungulla is an early maturing variety which under suitable conditions produces grain approaching premium quality. It is a medium tall growing variety with a straw of excellent standing ability and holds its grain well. It is highly resistant to race 34 stem rust, but due to the fact that it derives its resistance from Eureka it is not resistant to the biotype of this rust race. This variety gives excellent promise and is favoured for its straw strength, earliness, prolificacy and its satisfactory grain quality.

Dowerin.—This variety was selected at the Merredin Research Station from a cross between Sword and Kenya C6041. It is resistant to all known races of stem rust in Australia, and is the only registered released variety which derives its resistance from this particular Kenya parent. An early mid-season maturing variety it is tall growing with fine straw and a tendency to weakness under certain conditions. The grain quality is in the upper range of the f.aq. It is resistant to flag smut and powdery mildew and has yielded well under trial particularly in the higher rainfall areas to which it seems to be most suited.

CROSSBREDS.

M.70.—Sword by Kenya C6041. An early maturing tall growing variety which is resistant to all known races of rust in Australia. It is similar to Dowerin.

M.77.—Eureka by Benenbbin. This early maturing variety has given promising yields, but is to be discarded from future trials as although its yielding ability is similar to Wongoondy the flour strength and straw strength are inferior to that variety.

M.88.—Eureka by Benenbbin. Tall growing wheat of good straw strength, highly resistant to race 34 of stem rust and moderately resistant to flag smut. It has yielded well in small scale yield trials and is being retained for further trial.

M.90.—Eureka by Bungulla. An early maturing variety which has been impressive in small scale trials, it is highly resistant to flag smut and race 34 of stem rust and produces grain of premium quality.

RECOMMENDED VARIETIES.

The standards adopted with regard to maturity of varieties in Western Australia has already been discussed in a previous article in this Journal Vol. XXV, No. 1, March, 1948, pages 92 to 94. A description of the recommended varieties which was included in that article is repeated here.

MIDSEASON.

Bencubbin.—This is the standard midseason variety which is the most extensively grown variety in Western Australia and also in Australia. Straw strength tends to be weak on light land, but is satisfactory for hay. Bencubbin is noted for its high yields under inferior seasonal conditions, but has been replaced by Bungulla by many farmers in the lower rainfall areas. It still remains the most prolific midseason variety for the Western Australian wheatbelt. It is resistant to flag smut but very susceptible to rust. Its flour strength is equal to the State f.a.q.

Kondut.—Has yielded well at Avondale for a number of years, but generally returns have been below Bencubbin. It is strong strawed and is recommended for planting on ploughed up clover land, on light land and under high rainfall conditions. Although not rust resistant it gives better yields under epidemic conditions than Bencubbin and Nabawa. It is resistant to flag smut, yields flour which is usually superior in strength to that of the f.a.q. and is strong strawed.

EARLY MATURING.

Dowerin and *Wongoondy.*—Descriptions of these varieties appear under the heading of New Varieties.

VERY EARLY MATURING.

Bungulla.—The standard early maturing variety which is a selection from Bencubbin. Like Bencubbin is notable for its high yields under low rainfall conditions. Because of its early maturity it usually suffers very little rust damage but it is not resistant to rust. It is resistant to flag smut. The increased popularity of this variety over the past five years in an indication of its value in the Western Australian wheatbelt, especially in the lower rainfall areas where it has produced consistently under very unfavourable climatic conditions. It is used extensively

for planting on ploughed up pasture land and was sown to 23.8 per cent. of the 1947 acreage sown to wheat for all purposes. Its main disadvantage is that it tends to be weak strawed, especially on light land and tends to lodge if sown before the third or fourth weeks of May.

Koorda.—A relatively recent release by the Western Australian Department of Agriculture, Koorda has yielded well on the lighter soils where its strong straw is of great value. Koorda is practically immune to flag smut and tends to be rust resistant in all but the heaviest epidemics. Flour strength of Koorda is about the same as that of the f.a.q. standard. It has gained popularity in this State during the past few years.

ACKNOWLEDGMENTS.

This opportunity is taken of expressing thanks to the Managers and staff of the Research Stations for their assistance in conducting the above trials.

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CAN WASHING MACHINES AND THEIR OPERATIONS.

A. H. HOBBS, H.D.D. Dairy Produce Inspector.

THE final container used in the production of milk or cream, is the can in which it is transported to the factory. The length of time the product remains in the can may vary from some hours in the case of milk to two or three days in the case of cream, therefore, it is of major importance that the cleanliness of the can when it receives the milk or cream should be of a high order.

There is some difference of opinion as to where the responsibility for the can's cleanliness lies. Some factory proprietors maintain that the onus is on the producer, since he is the owner of the product up to the point of sale i.e. the factory receiving floor; but it should be realised that if the farmer forwards his product in a clean can the can should be clean when returned to him. Further, as illustrated in Table I the Bacteriological influence of the can on the quality of the raw product is by no means small, and anything that the factory owner can do to improve it will ultimately be reflected by improvement in his manufactured article.

The W.A. Dairy Industry Act provides that "Suitable can washing and can storage accommodation shall be provided in every dairy produce factory or depot". It is the object of this article to discuss the suitability of the accommodation at

present in existence in this State, and at the same time to suggest ways in which it may be improved to ensure that the cans are returned to the farms in the best possible condition from a bacteriological point of view.

Bacteriological Influence of the Can on the Raw Product.

The following results, Table I, of the examination of washed milk cans at treatment plants were obtained during an investigation of the milk supply of a large American city. They serve to illustrate the high proportion of the bacterial content of the raw product which may be contributed by the improperly washed and dried can.

The physical condition of the interior of the cans was first noted i.e. whether wet or dry, and the odour classified as good, close, sour, or foul, 184 cans were examined of which 50 were dry and 134 wet.

An estimate was made from each count, of the number of bacteria which would be added per c.c. of milk placed in each can.

TABLE I.

	Dry Cans. No.	Dry Cans. %	Wet Cans. No.	Wet Cans. %
Physical Examination—				
Odour O.K.	40	80	5	3.7
Odour Close	3	6	39	29.0
Odour Sour or Foul	7	14	90	67.1
	50	100	134	99.8
Bacteriological Examination—				
Less than 1,000 per c.c.	33	70.2	13	10.0
1,000 to 10,000 per c.c.	5	10.6	6	4.6
10,000 to 25,000 per c.c.	4	8.5	6	4.6
25,000 to 50,000 per c.c.	1	2.3	10	7.6
Over 50,000 per c.c.	4	8.5	95	73.0
	*47	100.1	†130	99.8

* Three cans not examined bacteriologically that were examined physically.

† Four cans not examined bacteriologically that were examined physically.

These results show that 73 per cent. of the wet cans would transmit an initial bacterial contamination to milk placed in them exceeding 50,000 bacteria per c.c., and only 3 per cent. of these cans gave an odour which could be classified as O.K. Of the dry cans, 80 per cent. gave an odour which could be classified as O.K. and 70 per cent. gave a calculated contamination to the milk of less than 1,000 per c.c.

Investigators have shown that milk even when produced under unclean conditions seldom has an initial count exceeding 20,000 bacteria per c.c. Thus it can be readily seen that the dirty can may introduce more bacteria to the milk or cream than is usually introduced by careless methods of milking.

With regard to the cleansing and sterilising of cans, the first thought that comes to mind is that the cans themselves should be in a good state of repair. In some large treatment plants in the United States of America, a system of can selection is practised, i.e., the cans are examined on the conveyor after being tipped, and any which are in a bad state of repair, or excessively dirty, are not allowed to pollute the solutions in the machine, but are put aside to be either scrubbed by hand, or sent to the repair shop or discarded altogether. It is not possible to effectively cleanse and sterilise cans which are badly pitted or cracked.

From the work of the various investigators into the problem of mechanical can washing, there arise three salient points:—

1. The need for abundance of water and steam at adequate pressures.
2. The removal of as much as possible of the residue of milk or cream from the can before it is subjected to the cleansing process.
3. Arrangement of the various temperatures throughout the process so that the can will be delivered from the washer dry, or so hot that it will dry almost immediately.

Temperature bears a somewhat similar relation to the can washing process, to that borne by cleanliness to the manufacturing process. In the factory, despite the improvement which has taken place in the design of processing machinery, cleanliness still remains the major factor in turning out a good quality article; so with the can washing process, no matter how elaborate the construction of the machine, temperature, and the time-temperature combinations are the major factors in turning out a clean sterile can.

As with other factory plant, there is need for careful planning of the can washing layout to minimise the drudgery which has been a feature of this work in the past. It is only in this way that the operator can be expected to take an interest in the work, and the operator is a very important link in any mechanical set up.

In contemplating the installation of a new can washer, consideration of the following points may serve to ensure that satisfaction will be obtained for the considerable capital outlay involved.

1. Adequate space should be alloted so that pumps, jets, strainers, etc., will be readily accessible for inspection and cleaning, and that the driving mechanism is situated well clear of cans and operator.
2. The capacity of the machine should be based on the number of cans received, in such a way that the cans will be treated in a continuous flow to prevent congestion, e.g. it is frequently found in butter factories, that with a can intake of say 800 per day, 600 of these arrive in the afternoon. In such cases, it would be desirable to have facilities to handle 600 cans in 2-3 hours. It is much easier to wash cans immediately after tipping than if the milk or cream residues are allowed to dry.
3. Can washing machines to be efficient require copious quantities of steam and water. The detergent and rinse tanks usually have to be filled quickly and heated quickly. Water pipes should be not less than 1in. in diameter. This means a 2in. main to the machine. Quick heating and the maintenance of high temperatures while the machine is in operation create a serious drain on boiler capacity, and since can washing and pasteurisation usually proceed at the same time, if the boiler capacity is inadequate, this may result in inefficient treatment of the product.

4. A very necessary improvement in modern can washers and one which is receiving attention by machine manufacturers is the exhausting of the used steam from the machine. If the operator is forced to work in a cloud of steam he will be tempted, to reduce the steam flow to improve his working conditions, and it would be unjust to expect him to take the blame for unclean cans when the conditions are beyond his control. This is a bad feature with the flat topped rotary machines in use in this State. Unless they are placed well out in the open, there is always a cloud of steam in front of the loading bay, providing the temperatures are being maintained at the desired point. The operator is surrounded by steam and has to grope in the machine to find the cans. The "straight through" type of machine lends itself much more readily to the exhausting of the used steam, because its construction is such that the steam can be drawn from both ends towards the centre, and the steam uptake is placed in the centre of the hood.

5. In the case of milk cans a conveyor from the tipping point to the washer, equipped with a drip tray, on which the cans are inverted will ensure that they are in the best possible condition for washing when they reach the machine. On some of the more modern machines these draining extensions are standard equipment, and on some "straight through" types the cans and lids are fed automatically from the conveyor to the washer.

6. In some countries the capacity of cans varies greatly, the largest being as high as 25 gallons. Fortunately, in this State there are no "outsize" cans, the 11 gallon taper being the largest used. Hence a washer constructed to take these is suitable for all types of can in use. However, high pressure jetting is used to replace the scrubbing of cans washed by hand, and considerable jet pressure is required to efficiently cleanse these tall cans; much greater than that required for 3 gallon cream cans. In machines constructed to handle all types of can in use, the jet pressure should be considerably greater than the maximum required to cleanse the small can. Where the lid is jetted at the same pressure, some means of securing it to prevent misplacement is essential, otherwise the lid will not be cleaned effectively. The condition of the lid is just as important as that of the can.

There is a pressing need for the standardisation of can capacities. The industry has now reached a stage where the liquid product at any handling stage can be efficiently and economically handled in the standard 10 gallon milk can and the 5 gallon cream can, the former being used for either milk or cream. The construction of a machine to wash and sterilise cans of a standard type would be simplified immensely.

Straight through can washer. In the foreground is the milk receiving, tipping and weighing equipment.
Photo by courtesy "The Hunter Valley Co-op. Dairy Coy. Ltd", Hexham, N.S.W.

7. Increasing attention is being given on up to date can washers to thermostatic temperature control plus recording thermometers on the washing and rinsing sections, thus eliminating the human control factor. Equipment of this nature however, is costly and is perhaps only warranted in factories of large output. Good results can be obtained by mounting dial thermometers and jet presssure gauges on a solid panel, with the control valves for the various sections arranged alongside. This will enable the operator to see at a glance whether the desired temperatures and pressures are being maintained, and to make the necessary adjustments, while still attending to loading and unloading of the machine. It is awkward and dangerous for the operator to take the temperature of the solutions in a machine which is in operation, with an ordinary dairy thermometer; also the fragile nature of dairy thermometers precludes their satisfactory use for this purpose.

   The pressure gauge is the only accurate method of ascertaining whether the pump is delivering at full pressure. Hot solutions are frequently difficult to "pick up," especially if there is foam present. Further, if for any reason the impellor becomes partially choked, the pressure at the jets may be appreciably lowered without being discernible while the machine is in operation. The pressure gauge may not detect blocked jets, but it will indicate practically all other pump troubles.

Maintenance.—It is well to remember that a machine will not do the job required of it unless operated and serviced as the manufacturer intended. The operator is responsible for cleaning jets, etc. and the general sanitary condition of the machine, but this is not all that is required. Regular lubrication of the moving parts with the correct grades of lubricant is of vital importance to the efficiency and useful life of the machine. This should be the responsibility of the trained factory engineer. All too frequently it is found that little or nothing is done towards servicing the machine until the operator informs the engineer or foreman that some section is giving trouble.

The Water Supply.—Very few factories are equipped with water conditioning plants, and hence the water is used in the condition in which it leaves its source. Often this is quite suitable; but where the water is known to be hard and is not treated prior to use in the factory, some conditioning agent should be used to assist in preventing the formation of scale in pumps, pipes etc. and the gradual building up of milk stone in the cans.

Choosing a Detergent.—In the choice of a suitable cleanser for use in the can washer there are several things to consider, not the least of which is price. Proprietary cleansers suitable for washing tinware usually contain a high proportion of soda ash as a base. Soda ash is cheap in comparison with other alkalis and its use in the right proportion with good quality water is quite suitable for cleaning tinware. Its water softening qualities and wetting power however, are limited, and with the water supplies available for mechanical washers in most factories, the addition of substances which combine wetting, free rinsing and scale preventing properties is desirable. This is important, for in the mechanical can washer, the can is subjected to the detergent jetting for a short period only, and therefore, good wetting and rinsing qualities are more essential in a cleanser for this purpose than for washing tinware in other sections of the factory plant.

Using soda ash as a base, the addition of smaller amounts of Sodium metasilicate, tri sodium phosphate and sodium Hexametaphosphate will give a mixture which will produce the necessary reactions in a wade range of waters to give satisfactory cleansing results and trouble free running of the machine.

A combination of the above ingredients in the following proportions is recommended.

Soda Ash	54%	£19.1.0. per ton
Sodium Metasilicate	15%	£45.0.0. per ton
Tri SodiumPhosphate	20%	£53.5.0 per ton
Calgon (Sodium Hexametaphosphate)	11%	1/4½ per lb.
	100%	

Soda Ash forms the bulk of this mixture and is the cheapest cleanser available. Sodium metasilicate and tri sodium phosphate are very effective against protein solids and fats, are good wetting agents and rinse freely. Calgon is the water conditioning agent; its object is to maintain the mineral content of the water in solution and prevent it being deposited in the form of scale on the metal surfaces of the machine and cans. By so doing, it increases the softness of the water and improves the rinsability of the solution.

Sodium metasilicate is at present difficult to obtain but it may be replaced in the above mixture by increasing the quantity of soda ash.

This mixture is used at a concentration of .3% (3lb. per 100 gallons) and is suitable for use on all tinware in the factory plant, but it should be remembered that a hard water requires more cleanser than a soft water to produce a given alkalinity.

Because the usual factory practice is to use the one cleanser for the majority of cleaning operations, the preparation of stock solutions is of economic importance. The indiscriminate measuring out of small quantities of dry cleanser by several members of the factory staff is usually wasteful and results in solutions being used at varying strengths. In addition the dry cleanser is often dumped into the receptacle in which the washing is to be done, and sinks to the bottom where it forms a concentrated solution immediately surrounding it. If the receptacle happens to be a tinned vat, the result is the removal of a section of the tin. A similar quantity of a stock solution poured into a receptacle of water immediately disperses, and this trouble is prevented. Stock solutions are usually made up to 10 per cent. concentration. All that is required is a steel tank, slightly elevated, equipped with a stirring device and preferably connected by piping to the various points at which the solution is to be used. A suitable measure can be provided at each point.

As soda ash is marketed in bags containing 190 lb. it may be desired to prepare a stock solution using a full bag of soda ash as a base. In this case, assuming sodium metasilicate was not procurable the quantities of each ingredient would be:—

	lb.
Soda Ash	190
Tri Sodium Phosphate	55
Calgon	30
	275

This quantity should then be dissolved in 275 gallons of water to give a 10 per cent. solution. If a proprietary cleanser is to be used the stock solution is prepared similarly by adding 1 lb. of the cleanser to 1 gallon of water.

As can be seen from the summary of procedure at the various factories, an endeavour is often made to offset the mechanical inefficiency of the machine by increasing the concentration of the detergent solution. Properly pre-rinsed cans can be cleaned effectively with a concentration of .3 per cent., and it is unnecessary and costly to use concentrations above this figure. It is much more important that the pumps and jets are working to capacity and the cans are properly centred over the jets, so that a vigorous jetting is applied to all parts of the can and lid. If this is not occurring, the cleaning will not be done properly even though the concentration of the solution be doubled or trebled.

It is necessary however, to maintain the solution at .3 per cent. continuously. This is done by adding the requisite quantities of cleanser at specified intervals depending on the rate of reduction of alkalinity.

Testing the Strength of Detergent Solutions.—Equipment is now available which automatically registers the pH of the solution and determines the quantity of cleanser to add in order to maintain the correct concentration.

If this equipment is not provided, the alkalinity of the solution may be estimated in the following way:—

Apparatus Required:

25 ml. burette.
10 ml. pipette.
Porcelain dish.
N/10. Hydrochloric Acid.
Phenolphthalein Solution (as used for estimating the acidity of Cream or Milk).

Method.—From the well mixed solution in the detergent tank on the washer, procure a sample, and pipette 10 ml. into the porcelain dish. Add five drops of phenolphthalein and titrate with N/10 Hydrochloric Acid until the pink colour disappears. No. of mls. N/10 Hydrochloric Acid required X.04=% available alkalinity i.e., the alkalinity to phenolphthalein calculated as caustic soda.

Example.—Ten mls, of solution required 15 mls. of N/10 Hydrochloric Acid for neutralisation. Available alkalinity=15 X .04=.6%.

The capacity of the detergent tank should be first carefully ascertained, and sufficient cleanser added to give a .3 per cent. solution. If this is then tested for available alkalinity, the result obtained can be used as a standard with which to compare results of future samples, and for calculating the quantity of cleanser to add as the alkalinity of the solution in the tank decreases.

THE PROCESS.

The following table gives the recommended procedure with the various types of machines and cans:—

	Rotary.		Straight Through.	
	Milk Cans.	Cream Cans.	Milk Cans.	Cream Cans.
Pre-rinse Temperature	Not above 110°F.	Up to 130°F.	Not above 110°F.	Up to 130°F.
Detergent Temperature	180°F.	180°F.	150°F.	160°F.
Concentration	.3%	.3%	·3%	·3%
Hot Water Rinse Temperature			200°F.	200°F.
Steam Blast	50–100 lbs. pressure		50–100 lbs. pressure.	
Air Blast	Hot as possible		Hot as possible	

The Pre-Rinse.—All machines should be equipped with a pre-rinse section. The reason is obvious with milk cans, and even though cream cans may appear to have been completely rinsed on the cream saver, a further rinse gives the advantage of having the can surfaces warm and wet when they contact the detergent jet.

The pre-rinsing jet is usually direct from the main and whilst this is suitable and preferable for milk cans some means of warming the water would be more effective for cream cans. A control valve is necessary to minimise water consumption. The water used for the pre-rinse should be allowed to drain from the can and run outside the machine to the factory effluent drain to obviate fouling of the detergent solution.

Washing.—The detergent (.3 per cent. solution) should be sprayed vigorously into the can and lid at jet pressures of not less than 25 lb. per square inch. It has been estimated that at this pressure a minimum of three gallons of solution will be injected into the can, the actual quantity depending on the size of the apertures in the jet and the length of time the can is over it.

The cleansing and sterilising process may vary within restricted limits depending on the type of machine. In most rotary machines in use in this State, there is no hot water rinse; the rinsing out of the detergent solution and final sterilisation is accomplished by means of a jet of wet or saturated steam. Most "straight through" types have a hot water rinse between the detergent and steam sections. Therefore to obtain the required can temperature for effective sterilisation and drying from the steam jet and air blast in the rotary machine, it is necessary for the detergent solution to be hotter than with the other type. Some investigators have pointed out that there is a temperature limit to the effectiveness of cleansing solutions in respect to dairy equipment, above which there is a tendency for the milk residues to be baked on rather than removed. The temperature at which baking on is expected to commence is placed at 140°F. This however, is not so important if the pre-rinse has been thorough, and does not apply to the same extent with cream cans because of the high concentration of fat in the product, and the fact that the cans may have already been subjected to higher temperatures than this when in contact with the cream saver.

Stage at which to Replace the Detergent Solution.—There can be no hard and fast rule as to the number of cans which can be washed before replacing the cleansing solution. This depends on:—

1. The capacity of the detergent tank.
2. The degree of removal of milk residues from the cans at the tipping point and during subsequent draining.
3. The efficiency of the pre-rinse.

Solutions for cleaning tinware must be of necessity weak in comparison with those used for other purposes, e.g., bottle washing, to prevent corrosion of the tin. The effectiveness of a weak cleansing solution is dependent not so much on its strength, as on its volume in comparison to the amount of soiling material which it has to handle. For example, in washing say 200 cans, a much better result, for the same cleanser costs, would be obtained by using 200 gallons of solution at .3 per cent. concentration than with 100 gallons at .6 per cent. It may be argued that the cost of heating so much water would be prohibitive, but considering that in the butter factory the recommended procedure for washing a churn absorbs (for a 30 box churn) roughly 400 gallons of boiling water, it

is not unreasonable to use 100 gallons of hot water to wash 100 cans. It is recommended that 100 cans be the maximum number to be washed with 100 gallons of solution irrespective of its concentration.

The fat removed from the cans in the washer is not dissolved, but is in the form of an emulsion in the cleansing solution. Therefore it is obvious that as the fat content of the solution increases, so its ability to remove fat from the cans decreases.

The replacing of the solution can only be worked out under each factory's conditions, and may vary considerably between factories.

An appreciable saving in cleanser costs is possible by maintaining an efficient pre-rinse, thus reducing the work to be done by the cleansing solution, and increasing the number of cans which may be washed before replacing it.

The Hot Water Rinse.—Machines equipped with a hot water rinse possess two desirable advantages:—

1. Complete rinsing of the cleansing solution from the can.
2. An extra jet in the treatment line delivering water at near boiling point, thereby raising the can temperature to an effective sterilising point before it reaches the steam jet.

There should be a draining stage between the cleansing section and the hot water rinse, to reduce carry over of the detergent solution.

The water in the rinse tank should be changed frequently, or a small controlled flow of fresh water be allowed to enter at the bottom of the tank continuously.

The Steam Jet.—Steam pressures of 50-100 lb. per square inch should be available. On modern machines this section is equipped with a hot water-steam mixing device or ejector so that the jet comprises a mixture of water and steam. The important point here is that certain time-temperature combinations are essential to produce complete sterilisation, therefore because the can is over the jet for a specified short time only, it is necessary that the steam pressure and temperature be sufficient to bring about sterilisation in that time.

Air Blast.—The air blast in the majority of machines at present in use in Western Australia receives its heat as it passes through a coil or drum submerged in either the detergent or rinse tank. In some of the more modern ones the air passes over a steam heated radiator. The maximum air temperature available with this method is about 135°F.-150°F. depending on the air flow, therefore it is not expected that the air should have any sterilising effect. Its object is to dry out the can by moisture absorption; and its ability to absorb moisture increases with the temperature. The hotter the can when it contacts the air blast, the more easily will the moisture be removed.

With the usual can handling operations in factories the necessity for prompt return of cans to rail or road transport will not permit that time be allowed for cans to be inverted to drain. Thus if the machine drying has been incomplete, varying amounts of water are left in the can which become a breeding ground for micro-organisms.

Washing Cans by Hand.—Broadly speaking the conditions which apply to machine washing apply also to hand washing.

The operation is usually carried out with the aid of brushes, in a tub or vat of relatively small capacity. It is therefore very necessary that the cans be well rinsed with water from a hose or other jet before being placed in the cleansing tub, to prevent fouling of the solution. In addition the solution in the tub should be changed frequently. Scrubbing should be vigorous paying particular attention to corners and shoulders.

Because the hands come in contact with the washing solution, the temperature must be not higher than can be comfortably borne i.e., 130-135°F. The detergent mixture mentioned previously is suitable, or if the water is of good quality, soda ash alone (.2%-.3% solution) may be used with success. A second tub containing fresh water at 160°F. for rinsing is desirable.

The brushes used in hand washing may be a serious source of contamination if neglected. They should have stiff bristles and a stiff wing at one or both ends and should not be allowed to become foul from decomposing milk solids. The odour of a brush is a good indication of the bacterial activity which has taken place in it.

Usually where hand washing is practised there is sufficient time after the completion of the process for the cans to be inverted on racks to drain, therefore if the cans and lids are sterilised by inverting over a steam jet at 50 lb. per square inch pressure for at least one minute and then drained on racks, the results should be satisfactory.

The following summary of methods and equipment in use in the factories in this State has been prepared from the results of a survey, recently conducted by Field Officers of the Dairy Branch.

1. In all factories visited, except one, rotary machines were installed.
2. In some factories the cans were pre-rinsed, but in most of these it was done only as a means of saving cream, i.e., the rinsing was done by the steam jet on the cream saver. Only one factory was equipped with a pre-rinsing jet on the machine.
3. Detergent solution temperatures varied between 130°-200°F.
4. Detergent strength varied between .05 per cent. and .6 per cent. Practically all factories were using soda ash alone. In one, a mixed cleanser was used consisting of soda ash, sodium metasilicate, soft soap and calgon. This mixture was used at .15 per cent. and this factory appeared to be getting the best results of all those visited.
5. There were no tests taken for alkalinity.
6. In only one case was there any temperature control. This was thermostatic on the cleanser tank. There were no thermometers on any machine.
7. Three machines were equipped with either a hot water rinse or saturated steam jet. Even in these there was no means of ascertaining the temperature other than dairy thermometers.
8. On four machines, although steam jets were provided, they were not working. Cans were steamed in all other cases.
9. All machines, except one, were equipped with an air blast, all of which were working, but in only two cases were cans dried satisfactorily.

10. Only one machine was equipped with a used steam exhaust.

11. The number of cans washed per change of detergent solution varied from 100 to 600. Capacity of detergent tanks varied between 70 gallons and 200 gallons, hence in some cases as many as 600 cans were washed with 200 gallons of solution, and the cans were not pre-rinsed.

12. In only two cases were cans washed and dried satisfactorily.

One officer's remarks regarding the condition of washed cans at a factory where the methods and equipment were poor, were as follows:—

"Conditions of cans at time of visit was very poor. A brown scum was noticeable and could be scraped off a great number of cans. Cans were not dry. Water was too cold to obtain efficiency."

To illustrate the importance attached to the subject of can washing in England the following list of treatment stages for both cans and lids recommended for a well designed machine is given:—

1. Pre-rinse with cold or warm water.
2. Draining stage.
3. Pump pressure fed jetting with detergent (or hot water) at not less than 160° F.
4. Draining stage.
5. Pressure rinsing stage, pump fed or by steam ejector at 180° F.
6. Final fresh water rinsing with steam ejector at 180-200° F. (This and the previous stage is often combined on small output machines).
7. Live steam injection.
8. Hot air drying at 180-220° F.

At first glance this appears somewhat of a factory manager's dream. The fact remains that the industry in this State is fast approaching a stage where large numbers of cans have to be handled promptly, and efficiently in factories of ever increasing output.

The labour available has long deplored the drudgery attached to can washing, and will neglect the job where it is difficult. As the size of the job increases under inefficient conditions, so the drudgery increases, and the important points associated with cleansing and sterilising are neglected.

It behoves the proprietors of all dairy produce factories in Western Australia to give this matter careful consideration, with the end in view of improving the quality of our butter, cheese and condensed milk through improvement in the quality of the raw product.

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OATS IN THE WHEATBELT.

I. THOMAS—Superintendent of Wheat Farming.

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IN the early history of the development of the wheatbelt of this State the growing of oats was of comparatively minor importance and for some time was confined to the more favourable rainfall areas. However, as the need for greater diversification of agriculture in the wheatbelt was appreciated, stock became an important adjunct to wheat farming, and with the increase in the number of stock, mainly sheep, the area of oats increased considerably. Although the acreage of wheat has fluctuated considerably from time to time, that of oats has shown a more even increase. The acreage of oats grown for all purposes in 1947-48 was 878,777 of which 278,184 were for green feed.

The increase in the area sown has been made possible to a large degree by the development of early maturing oat varieties suited to the drier areas of the wheatbelt. That oats have become an integral part of the wheatbelt programme can be appreciated from the fact that the acreage of this cereal is now approximately one third of that of wheat.

As an alternative crop to wheat it is invaluable to the wheat farmer in that its cultivation fits in well with his cropping programme. When grown for green fodder seeding can be commenced prior to the main cropping programme and when the crop is grown for grain it can usually be harvested before the wheat crop is ready.

From the disease point of view it is a useful crop for a wheatbelt rotation, as it is resistant to wheat rust, "foot rot" and "Take all." As has previously been recommended a year of fallow followed by an oat crop gives the spores of these latter disease organisms opportunity to germinate in the absence of favourab'e host plants and thus effects a measure of control. The fact that oats are less liable to malting permits of earlier sowing in the absence of sufficient moisture for germination which is a valuable characteristic in seasons when the opening rains are belated.

As indicated earlier oats are used extensively for grazing. This practice not only increases the stock carrying capacity but also assists in maintaining and improving the fertility of the land because of the organic matter which is returned to the soil.

However, although oats serve many useful purposes in the wheatbelt rotation it must be remembered that they are also a cereal crop and very closely resemble wheat and barley in their nutritional requirements.

So far as their value as a fodder crop is concerned they come into three main categories.

(a) Sown Specifically for Grazing.

The larger portion of the crop for this purpose is sown on wheat stubble land which is broken up with the first autumn rains. These crops provide a green "bite" in the earlier part of the season and in about five to six weeks from germination in many instances carry five to 10 sheep per acre for a period of 10 to 14 days. They may be grazed outright or left to recover for grain. Beside the fact that they provide a bulk of green feed earlier than natural

pastures, their utilisation in the early part of the season allows the natural pastures to make a body of feed before they need to be fed off. This tends to prevent selective grazing of the young pasture plants with the possible elimination of desirable types which are more palatable in their early growth stages. Oats also provide an excellent cover grazing crop in the first year of establishment of subterranean clover and other pastures. Cereal crops grown for early green feed are invaluable to fat lamb producers, and the same crop can be used for topping off lambs in the spring when grass seeds are a nuisance.

(b) *Sown for Hay.*

With the increasing difficulty in obtaining efficient labour and the high cost of wages, the high labour requirements of hay cutting now act against its extension. However, cereal hay is still a valuable fodder and the increasing mechanisation of hay baling may possibly favour larger areas of cereal being cut for hay.

The time of cutting cereal hay has a marked effect on both maximum yield and total digestible nutrients. The maximum yields of total digestible nutrients are obtained by cutting wheaten hay at the late milk stage and oaten hay at the early dough stage of grain formation. These times of cutting correspond with times of maximum total yield of hay (Underwood and Moir, 1947).

(c) *Sown for Grain.*

Results and comparisons of hay and grain yields give support to the conservation of cereal hay rather than grain. However, the total yields of dry matter are not the only consideration and cereal hay cut at any reasonable growth stage is a roughage of comparatively low digestibility and a very low content of digestible protein. Grain, on the other hand, is a concentrate, particularly well adapted for supplementing the poor dry grazing of the summer months, and, moreover, its digestible protein content is much higher than hay. At this time of the year a protein deficiency is probably the most important limiting factor in sheep husbandry (Underwood and Millington, 1947).

Oat grain has the advantage over wheat in that, due to its physical condition, it is more suited to bulk storage over long periods than wheat. Whereas wheat has to be regularly turned over and aerated when in storage for long periods, oat grain can be left for years. It is also less liable to weevil attacks than is wheat. Disadvantages experienced with oats are that they generally shed their grain more readily than wheat and also they are liable to lodging under unfavourable seasonable conditions.

SOIL PREPARATION.

Although oats may do better than wheat with less careful soil preparation, nevertheless, not considering all the other factors associated with crop growth, the better the soil preparation the better the crop. Normally, oat crops, which are intended to be cut for hay or harvested for grain, would probably be sown on fallow, either a long winter fallow or a short autumn fallow. When sown for early green feed the more common practice is to sow them on the previous year's wheat stubble following upon the first appreciable autumn rains. The latter practice allows of early sowing on a fairly good seed bed with a reasonable degree of weed control and probably disc implements would be most suitable for this purpose.

The purpose for which the crop is grown will to a large extent determine the seeding rate, but generally 40 lb. per acre is recommended when the crop is to be grazed right out. When recovery is desired, this rate may be increased to advan-

tage up to 60 or 70 lb. per acre. The actual seeding rate will, however, vary with the purpose of the crop, time of sowing, district, and the stooling habit of the particular variety sown. When sown as a cover crop in the establishing of pastures, 20 lb. of seed is recommended.

With regard to fertiliser requirements, if sown on fallow, the usual rates as used for wheat should be adopted. When planted on stubble land and superphosphate supplies are limited, the normal rate of application may be decreased rather than limit the application at heavier rates to only portion of the area. However, having regard to previous applications, it is not recommended that the rate be less than 40 lb. per acre, particularly for light soil types. Recent experiments with oats indicate that small quantities of minor elements may be necessary to ensure maximum yields on some types of light soils.

The ideal sample for seeding is a well threshed and well cleaned plump grain and the seed should be dusted with one of the proprietary mercurial dusts for the prevention of smut.

VARIETIES.

The selection of suitable varieties is all important. In this connection the maturity and the purpose for which the crop is intended to be used are of first consideration, having regard to the climatic conditions under which it is to be grown. Like wheat, the number of varieties should be limited to, at the most, three. In many instances one variety of oats will be found sufficient. To assist in this connection the wheatbelt is divided into three maturity zones based on annual rainfall. The Road Boards in each zone are—

Zone 1—Early	*Zone 2—Midseason*	*Zone 3.—Late*
(Under 14 inch)	(14-18 inch)	(18-20 inch and above)
Mullewa	Northampton	Greenough
Morawa	Upper Chapman	Irwin
Perenjori	Geraldton	Moora
Dalwallinu	Mingenew	Victoria Plains
Dowerin	Three Springs	Toodyay
Wyalkatchem	Goomalling	York
Koorda	Carnamah	Brookton
Mt. Marshall	Wongan-Ballidu	Cuballing
Mukinbudin	Northam	Narrogin
Westonia	Meckering	Wagin
Nungarin	Corrigin	Katanning
Merredin	Kulin	Broomehill
Kellerberrin	Quairading	Tambellup
Kununoppin	Wickepin	Woodanilling
Bruce Rock	Dumbleyung	Esperance
Narembeen	Kent	(Southern 1/3)
Kondinin	Beverley	
Lake Grace	Pingelly	
Yilgarn	Gnowangerup	
Dundas		
Esperance		
(Northern 2/3)		

Under normal conditions grazing crops will be planted late April or early May. When intended for hay or grain the later maturing varieties will be planted during the first half of May and the early and very early maturing varieties

during the latter half of that month and extending into June. Too early sowing of the early maturing varieties produces a rank tall crop with a greater tendency to lodging.

The following is a table of the varieties now recommended by the Department of Agriculture as a result of the experimental and selection work at the Agricultural Research Stations and elsewhere. The factors for which improvement has been effected are grazing ability, yield and straw strength.

Zone 1	*Zone* 2	*Zone* 3
Dale (late midseason)	Algerian (late)	Algerian (late)
Guyra (midseason)	Fulghum (grazing only)	Fulghum (grazing only)
Ballidu (early)	Guyra (midseason)	Guyra (midseason)
Wongan (very early)	Dale (midseason)	Dale (midseason)
	Ballidu (early)	Ballidu (early)
	Wongan (very early)	Wongan (very early)

A seeding calendar for recommended varieties is also included.

Annual Rainfall.	April.	May.		June.
	3rd–4th week.	1st–2nd week.	3rd–4th week.	1st–2nd week.
Below 14 inches	Dale	Ballidu Guyra	Ballidu Wongan	Wongan
14 inches–18 inches	Algerian	Dale Guyra	Ballidu	Wongan
Over 18 inches .	Algerian .	Algerian . Dale	Guyra Ballidu	Wongan

A crop of Ballidu oats on the Wongan Hills Research Station. Part of the crop has been cut for hay and the remainder left to mature grain.

OAT VARIETIES.

Two of the more important disadvantages of oat cultivation are that the crops tend to lodge badly, particularly following adverse weather conditions, and also that they tend to shed their grain more easily than wheat. With these two points in mind plant breeders have aimed at producing high yielding varieties of oats

with straw strength and non-shedding characteristics. From a cross between Mulga and Burts Early made at the Wongan Hills Research Station three varieties were selected, Dale, Ballidu and Wongan. The ability to withstand unfavourable weather, the straw strength, and yielding ability of these varieties represent a notable achievement. They are suitable for grain and hay and also for early green grazing and recovery and with their differing maturities cover the range of the planting season. For many years the introduced varieties Algerian, Burts Early, Mulga and Guyra were the principal oat varieties cultivated. With the exception of Algerian these are now being largely replaced with the more recent productions. The acreage sown to oats for all purposes of the principle varieties during the past three seasons is as follows:—

ACREAGE SOWN TO MAIN VARIETIES OF OATS FOR ALL PURPOSES.

1945/46.		1946/47.		1947/48.	
Variety.	Acreage.	Variety.	Acreage.	Variety.	Acreage.
Mulga . (1)	126,136	Wongan ... (3)	130,590	Ballidu ... (5)	201,081
Guyra (2)	117,549	Algerian . . (4)	127,812	Wongan . (1)	150,836
Wongan (3)	114,902	Fulghum (5)	117,089	Algerian (2)	130,500
Algerian . (4)	105,867	Guyra . (2)	111,094	Fulghum (3)	114,162
Fulghum . (5)	97,347	Ballidu .. (6)	104,169	Guyra . (4)	101,585
Ballidu . (6)	40,691	Mulga .. (1)	97,404	Mulga (6)	79,207
Burt's Early (7)	39,166	Burts Early (7)	33,806	Palestine .. (8)	31,606
Palestine . (8)	21,231	Palestine .. (8)	29,296	Burts Early (7)	28,734
O.K. . .. (9)	6,933	Dale (10)	9,790	Dale (9)	16,059
Dale . (10)	3,884	O.K. (9)	4,888	O.K. (10)	4,454
Other Varieties	64,473	Other Varieties	19,346	Other Varieties	20,553
Total area sown to all Varieties	738,179	.	785,284	. . ..	878,777

Figures in parentheses indicate position held by variety in previous year.

Oats are classified according to maturity as follows:—

Very early maturing.—Flowering four or more days earlier than Mulga.

Early maturing.—Three days earlier to six days later than Mulga.

Midseason maturing.—Seven to 14 days later than Mulga.

Late maturing.—15 or more day later than Mulga.

The following are short descriptions of the recommended varieties which are at present being produced as pedigree seed:—

Late Maturing.

Algerian.—This variety is cultivated chiefly in the Great Southern areas of the wheat belt, where it is a useful general purpose variety. It is also used extensively for oatmeal manufacture.

Midseason Maturing.

Guyra.—The principal midseason variety, Guyra is notable chiefly for its plump grain. Although a popular hay variety the straw tends to be very coarse under favourable conditions of growth, and lodging frequently occurs where crops

are left for grain. Guyra is an indifferent variety for grazing and recovery since the early growth is relatively sparse and the grain yields subsequent to grazing, only fair.

Fulghum.—This is not a good general purpose variety as the straw strength is very poor. Fulghum is used principally for grazing and recovery since the notable length of its leafy growth phase prior to "shooting" enables it to be grazed later in the season than other midseason varieties. As a grazing oat the initial growth is not as vigorous as that of Dale but it is, however, very suitable for late winter or early spring feed.

The grain of Fulghum is suitable for oatmeal manufacture.

Dale.—This has given satisfactory results as a general purpose variety under a wide range of conditions. It is markedly superior to other midseason varieties in respect to straw strength and for early grazing.

Early Maturing.

Ballidu.—This variety has demonstrated its general superiority to Mulga in trials on Research Stations and is proving satisfactory on farmers' holdings. The straw strength and grain yields are outstanding whilst its vigorous, leafy early growth and satisfactory recovery make it suitable for grazing and recovery.

Very Early Maturing.

Wongan.—This is notable for its vigorous early growth and strong straw. It is satisfactory as a hay variety although it is often rather short strawed. As a grain variety, it stands well but tends to shed if left unharvested after it has matured.

The vigorous early growth makes Wongan a suitable variety for early winter feed, but it cannot be grazed as late in the season as Ballidu and the midseason varieties if recovery for grain is desired.

GRAZING.

A comprehensive discussion on this subject has appeared in a previous publication (Utilisation of Cereals for Green Fodder, H. G. Cariss Journal Dept. of Agriculture W.A. Vol. XXII June 1945) It is of interest however to repeat the conclusions arrived at in that article, namely—

1. Oats should not be grazed beyond the date where the critical change in growth occurs. This critical change occurs when the plant growth changes from the vegetative or grassy to the reproductive or stemmy.
2. When feeding off the crop it is essential that each grazing should occupy only a short period with a large flock of sheep to prevent selective grazing.
3. Sheep should not be turned into the paddock when it is in a very wet condition, as pugging of the soil may result with a detrimental effect on plant recovery.
4. Crops intended for grain should not be grazed unless absolutely necessary, but in the event of such necessity arising then grazing must be rapid and over a very short period to permit of the maximum period for recovery.

OAT VARIETY TRIALS.

Each year oat variety trials are conducted on the wheatbelt Research Stations with the object of determining the most suitable varieties which can be recommended for planting under Western Australian conditions.

TABLE 2.

OAT GRAIN TRIALS, 1948—WHEATBELT RESEARCH STATIONS

Variety.	Maturity.	Grain Yield.	Per cent. of Control. 1948	Per cent. of Control. Average.
WONGAN HILLS RESEARCH STATION—		bus. lbs.	%	%
Late Planted Trial:				
Ballidu	Early	23 0	134	142 (8)
Guyra	Midseason	17 11	100	100
Wongan	Very Early	18 35	109	113 (6)
Early Planted Trial:				
Algerian	Late	20 3	105	112 (8)
Guyra	Midseason	18 35	100	100
Dale	Midseason	20 8	107	114 (8)
MERREDIN RESEARCH STATION—				
Late Planted Trial:				
Ballidu	Early	15 37	442	136 (8)
Guyra	Midseason	3 24	100	100
Wongan	Very Early	14 21	421	123 (8)
SALMON GUMS RESEARCH STATION—				
Late Planted Trial:				
Ballidu	Early	12 14	91	100 (7)
Guyra	Midseason	13 20	100	100
Wongan	Very Early	10 14	76	92 (6)

Number of trials indicated in parenthesis.

These trials are sown on a three plot system which enables each variety to be harvested as it matures and reduces the possibility of variation in yields due to the earlier maturing varieties shedding before the later varieties are ready for harvesting.

SEASONAL CONDITIONS.

Seasonal conditions throughout the wheatbelt varied considerably during 1948, and the following is a brief summary of the conditions experienced at each of the Research Stations:—

Avondale.—Very little rain was recorded before the month of June and consequently seeding operations were much later than usual. Despite the lateness of the opening rains 1,183 points were recorded for the growing period, which compares favourably with the average rainfall. There were heavy falls registered during the months of June, July, August and September with lighter falls in October and November. Most crops finished off reasonably well.

TABLE 1.

Station.	Year.	Jan.	Feb.	Mar.	Apl.	Growing Period Rainfall.							Nov.	Dec.	Annual Total.
						May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Avondale	1948	0	0	71	35	6	385	214	246	249	83	1,183	63	9	1,361
Average	22 years	23	34	101	79	217	337	308	240	106	80	1,288	53	31	1,609
Chapman	1948	0	0	34	105	0	257	220	198	97	15	787	46	0	972
Average	43 years	26	38	66	75	230	425	389	262	144	88	1,538	39	25	1,807
Merredin	1948	28	11	56	161	4	189	204	192	102	38	729	33	16	1,034
Average	37 years	42	53	95	90	136	196	185	153	81	75	826	42	55	1,203
Salmon Gums	1948	0	417	30	120	9	152	137	112	51	105	566	141	9	1,283
Average	23 years	80	87	139	93	121	151	142	146	91	112	763	91	76	1,329
Wongan Hills	1948	1	5	140	187	0	175	290	370	104	19	958	83	8	1,382
Average	23 years	33	45	96	96	187	270	261	208	91	70	1,087	45	40	1,442

Chapman.—Rainfall throughout the year was very light and well below the average each month, only 787 points were recorded for the growing period, compared with an average of 1,542 points. No rain was recorded in May and only about half the average rainfall registered for June.

Merredin.—Following upon a good heavy rain at the end of April which allowed the fallow to be worked into good condition, no appreciable rains were recorded until the 6th June. Comparatively dry conditions were experienced during the remainder of the growing period and these, together with the hot dry winds experienced in September and October caused severe setbacks to the crops. Good falls were recorded late in September, but they were too late to be of much benefit to the crops generally.

Salmon Gums.—Early rains recorded in February enabled the fallow to be worked into good condition. Following upon a good fall in April no appreciable rains were experienced until early June. Good falls were recorded in June, July and August and later falls in October resulted in quite good yields being obtained.

Wongan Hills.— Following upon the good rainfall registered in April no rain at all was recorded for the month of May; however, rainfall for the remainder of the growing period was satisfactory except perhaps for October, when only 19 points were recorded, and crops generally made good growth.

Details of the rainfall recorded at each of the Fesearch Stations during 1948 are given in Table No. 1 and results of the oat variety trials carried out in 1948 are tabulated in Table No. 2.

Oat grazing and recovery trials are also conducted at the Merredin and Chapman Research Stations, but during the past two years the seasonal conditions have been such that following upon grazing the trials have failed to recover, and therefore results were not available. The practice in these trials is to cut representative portions of each plot to ascertain the green feed value as soon as the average of the varieties reaches 6ins. in height. The plots are then heavily and speedily grazed to a uniform sward by sheep. The plots are subject to further sampling and grazing if seasonal conditions permit and finally they are left to mature grain.

ACKNOWLEDGMENTS.

This opportunity is taken of thanking the farm managers and staff of the Research Stations for their assistance in the above trials.

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AN EXPERIENCE IN ARGENTINE ANT CONTROL.

By P. N. FORTE, Assistant Entomologist.

INTRODUCTION.

SINCE the discovery of the Argentine ant in Western Australia, its control has been a foremost problem with the Entomological Branch of the Department of Agriculture.

The first avenue explored was control by baiting, but with the advent of D.D.T. as an insecticide it was tried as a possible control for this pest. Correctly used, D.D.T. proved to be as effective and spectacular in controlling Argentine ants as it has been with such insects as flies and mosquitoes.

The use of D.D.T. was then recommended by this Department for ant control, and good reports followed when it was used according to departmental directions.

A PERSONAL EXPERIENCE.

In September, 1947, the author had an opportunity of applying the departmental recommendations under careful supervision when his own block, in one of the suburbs of Perth, became invaded by Argentine ants.

The invasion was not discovered until September, 1947, when the back half of the yard was cleared of grass to prevent summer fires. It was then found that the Argentine ant had gained a firm hold on most of this area (about one-third of the quarter-acre block) and that they had supplanted the native ants which were previously plentiful.

A survey of the blocks in the vicinity showed that those on either side were also being invaded by Argentine ants, and that the blocks behind had evidently been invaded for some time. The householders concerned were all approached and advised of the best measures to adopt to control the pest.

I had always believed that it should be possible to isolate not only a house but the whole building block in an infested area from the Argentine ant, by the use of a D.D.T. sprayed strip, and therefore decided to try the method out in this instance.

Method of Attack.

In the first place, all shrubs, plants and hedges were pruned back so that they did not touch the fence anywhere and no branches of trees were allowed to touch others in adjacent blocks. All rubbish, dry leaves, etc., were cleaned up and burnt. Then with a knapsack spray a D.D.T. emulsion at 2 per cent. strength was sprayed in a band approximately 8in. up the picket fence and 4in. on the ground out from the pickets. This was applied to the two side fences and the back fence, all being of the picket type. It was not necessary to spray the front fence as the infestation had not reached this point.

Interesting Observations.

The result was immediate and spectacular. All ant trails using the lower part of the fence disappeared, both those coming straight through and those using the fence itself. For weeks after, this state of affairs persisted.

Characteristic trails of the Argentine Ant on a tree trunk.
(From U.S. Dept. Agric.)

Eradication within the Area.

Attention was then turned to the Argentine ants present inside the block. This infestation consisted of nests situated in bare sand and some in the lawn and gardens. The trails and nest holes were carefully sprayed with a 2 per cent. D.D.T. emulsion, and the results were very interesting. Those worker ants sprayed

were killed more or less at once and the activity from the nests ceased. Observations a few hours later showed that numbers of winged male and female ants had emerged and were lying struggling within about a foot of the nest entrance.

Subsequently, a number of worker ants ventured out and were found dying in a similar way. Without disturbing the sprayed surfaces around the nest hole, observations were made each morning on the following days. At these times worker ants could be seen struggling on the ground near the nest entrance and were found dead some time later. It took several days in most cases before activity from the nests ceased altogether, and when this occurred the nest was dug up and the ants were found to have been completely killed out.

The longest period taken for one nest to be cleaned up with one spraying was nine days. The same good results were obtained on lawns, and therefore I was able to eradicate the ants from the block.

Re-infestations.

A careful watch was kept and some weeks elapsed before a thin trail of worker ants appeared between two pickets and stretched 30ft. into the block to raid the nest of a native ant species. This occurred overnight and following a shower of rain. The trail was quickly removed with a 2 per cent. D.D.T. emulsion spray.

It was thought that possibly the effect of the D.D.T. was wearing off, and so the band around the fence was again sprayed. Since then an occasional trail has penetrated the block, but observations about once a week have revealed these and they have been dealt with immediately.

During the winter of 1948 little ant activity was evident, and it was not until early summer that it was necessary to respray the boundary. At this time when the weather warmed up and the conditions were humid, the Argentine ants were very active and it was necessary to deal with a number of trails and several nests, but these were easily removed by the method described.

Frequency of Application.

The fence line has since been sprayed twice—making three times this summer. The amount used at each spraying was approximately one-third gallon of 20 per cent. D.D.T. emulsion, which would cost approximately 10s.

Watch Points of Contact.

The places which must be watched are mainly points of contact with the fence and inside the block. Many of these occur subsequent to the spraying Shrubs grow and touch the fence and must be pruned back again; hedges do likewise. Sticks or branches may fall and make a bridge from above the D.D.T. line on the fence to the ground inside the block. In the case of permanent structures, such as lattices touching the fence, the area of contact must also be sprayed with D.D.T.

Isolating the House Itself.

It has also been demonstrated to my satisfaction that a house on an infested block can be isolated with a D.D.T. barrier and so kept free from ants. Again the precautions necessary are to see that all shrubs, etc., are pruned away, so that they do not touch the house, and that all other points of contact, e.g., lattices, are sprayed with D.D.T. Then a similar strip of D.D.T. is sprayed around the foundations as that described for use around the fence.

Where gardens or lawns run up to a wall, it is sometimes difficult to detect ant activity, and one person overcame this by running a 4in. cement strip around the junction of the wall and the ground, except where a cement path was already present. This strip was then kept sprayed with 2 per cent. D.D.T., and it was a simple matter to watch for further invasions.

Treatment of Whole Block.

Where it is desired to completely eradicate Argentine ants from a block, it is first necessary to clean up and dispose of by burning or otherwise all rubbish, tins, bricks, etc., which may be lying around. Then everywhere from the house foundations to the fence should be sprayed with 2 per cent. D.D.T. emulsion. The quantity of spray required for a treatment such as this is approximately 20 gallons for a quarter-acre block or two gallons of 20 per cent. D.D.T. emulsion costing approximately £3.

METHODS USED SUCCESSFULLY BY COMMERCIAL PEST EXTERMINATORS.

These recommendations have been used by commercial operators with effective results, and are therefore advised with complete confidence.

Summary.

1. Argentine ants can be cleaned out by the recommended use of D.D.T. sprays.
2. A complete clean up of all rubbish is essential before spraying.
3. All points of contact with the infested area and the area to be kept clean must be sprayed with a 2 per cent. D.D.T. emulsion.
4. Careful pruning of all plants on the boundary, so they do not touch the area to be protected is essential.
5. A certain amount of vigilance and spot spraying subsequently will be necessary.

BLACKLEG IN CATTLE.

C. R. TOOP, Acting Chief Veterinary Surgeon.

Blackleg is almost essentially a disease of young cattle usually affecting animals between the age of six and 18 months.

It is characterised by the development of crepitant swellings on the neck, chest, shoulder or hindquarters and sometimes on other parts of the body, and this is accompanied by symptoms of acute illness which in most cases terminates fatally after an interval of 18-36 hours.

It is caused by infection with *Clostridium chauvoei*, a short rod shaped micro-organism or bacillus which occurs in the soil and is believed to gain entrance to the body through abrasions in the skin or mucous membrane of the digestive tract. *Clostridium chauvoei* produces spores which are able to survive in the soil for long periods. Consequently when the infection has become established on a property, outbreaks of the disease may continue to occur for many years.

Although blackleg may occur under a wide variety of conditions it is most frequently observed on moist low lying areas. In Western Australia it is confined to the South-West coastal districts and has not been reported from the drier inland areas.

The disease may be prevented by inoculation with blackleg vaccine which confers upon the treated animals a strong and lasting immunity and is usually sufficient to protect young cattle from infection during the period when they are most susceptible.

MODE OF INFECTION.

It should be recognized that blackleg does not spread directly from animal to animal but results from infection with an organism existing in the soil. The blackleg bacillus (*Clostridium chauvoei*) is always present in the soil of affected properties and so far as is known enters the body through small wounds and punctures in the skin or through abrasions in the mouth or tongue or other portions of the digestive tract.

The carcass of an animal dead of blackleg contains enormous numbers of infective organisms and should it be allowed to decompose and disintegrate in the field gross contamination of the soil will inevitably occur. Such carcasses should, therefore, be promptly destroyed by burning or if this is impracticable by deep burial preceded by a liberal application of quicklime. The organisms are also able to multiply in the soil.

The formation of spores which are very resistant to extremes of temperature and drying enables the infection to persist in the soil for many years so that after the disease has made its appearance on a property recurrent mortalities are likely to take place.

SYMPTOMS.

The disease has a definite age incidence usually affecting young cattle between the age of six and 18 months. It may also be observed on occasions in calves four to six months old but seldom affects animals above the age of two years. In districts where blackleg is prevalent cattle over three years may be regarded as immune.

The onset of the disease is sudden. The earliest symptoms consist of loss of appetite and cessation of rumination together with high fever and rapid respiration. The animal appears dull and depressed, is reluctant to move and lies down frequently. The development of swellings on the shoulder, neck, chest thigh or flank, and sometimes elsewhere on the body is a characteristic feature of the disease and this is usually accompanied by lameness affecting the fore or hind limbs.

The swellings are at first small and tender but rapidly increase in size becoming large and extensive and non-sensitive. Upon pressure a peculiar crackling sound is heard due to the presence of gas beneath the skin which is formed during the growth of the casual organism in the underlying tissues. Similar swellings are sometimes observed on the gums, tongue, and pharynx,

From this stage the condition of the animal rapidly deteriorates and soon it is unable to rise. Death generally occurs from 12-36 hours from the onset of symptoms and is preceded by prostration and muscular tremors.

Treatment offers little prospect of success and is usually not worth attempting.

POST MORTEM APPEARANCES.

Soon after death the carcass becomes tightly distended with gas so that the uppermost limbs may extend straight out from the body and a dark coloured frothy discharge exudes from the mouth, nostrils and anus.

At post mortem the skin overlying the swelling appears dark, dry and parchment-like, and a dark frothy fluid with a sour disagreeable odor escapes when the swelling is incised. The underlying muscles are distended and are brown or black in colour and are infiltrated with blood stained liquid and gas. Apart from the presence of fluid in the abdomen and chest cavity and some congestion of the liver and kidneys no changes of note are observed in the internal organs.

PREVENTION.

Vaccination.—The disease may be prevented by inoculation with blackleg vaccine which provides the only practical and effective means of control. An injection of 5 cc. of this product given beneath the skin either in front of or behind the shoulder, results after an interval of 14 days in the development of a strong immunity which endures for 12-18 months and is therefore capable of protecting young animals from infection during the period when they are most susceptible to the disease.

In localities where the disease has a seasonal incidence young stock should be vaccinated annually at least 14 days in advance of the period when losses are expected to occur. Where the disease occurs irregularly calves should be vaccinated upon reaching the age of four to six months. It should be noted that blackleg vaccine is not a curative and is only of value for the prevention of the disease. When, however, the disease makes its appearance on a property the immediate vaccination of the animals which are still healthy followed by their removal to a fresh paddock for a period of 14 days can be relied upon to check the mortality.

As an additional control measure the carcass of any animal dead of blackleg should be destroyed by burning or by burial to a depth of six feet together with the application of quicklime.

NEW CEREAL VARIETIES IN AUSTRALIA.

I. THOMAS—Registrar of Cereal Varieties in Australia.

DURING 1948 three new wheat varieties were submitted for registration. Of these one was sponsored by the Waite Agricultural Research Institute, Adelaide, the other two being produced by the Western Australian Department of Agriculture. Particulars of the new varieties as supplied to the Registrar are as follows—

GLENWARI.

A variety of midseason maturity Glenwari was derived from the cross Nabawa x (Riverina x Hope) made by S. R. Hockley at Adelaide in 1932. Subsequent selection was carried out at the Waite Agricultural Research Institute by I. F. Phipps.

Glenwari possesses straw of medium height that stands well and has a white square shaped slightly tip awned ear which does not shed. The reaction to disease includes resistance to leaf rust, race 34 and its biotype of stem rust, and flag smut. It is of average baking quality and possesses good yielding ability. The Waite Institute states it is capable of outyielding Warigo as a rust resistant wheat grown in more severe districts than is optimum for that variety.

WONGOONDY.

This variety was derived from a cross between Eureka and Bungulla made by E. C. B. Langfield at the Merredin Research Station in 1940. It is an early maturing variety which, under suitable conditions, produces grain approaching premium quality. It is medium tall growing with a strong straw which stands well, and has a white, tip tapering, tip awned ear which does not shed its grain. Wongoondy possesses a strong resistance to flag smut and to race 34 of stem rust, but is susceptible to the biotype.

Yield data from trials on five research stations and two farmers holdings indicate that Wongoondy is a very good yielder over a wide range of soil and climatic conditions.

DOWERIN.

This variety was also produced at the Merredin Research Station by E. C. B. Langfield from a cross between Sword and Kenya made in 1937.

It is of early to midseason maturity and is tall growing with fine straw which shows a tendency to weakness under certain conditions. The ear is white, tapering and partly bearded, yielding grain which is in the upper range of the Western Australian f.a.q. standard. The grain is held well, although threshing is inclined to be somewhat tough.

Dowerin possesses very good resistance to both race 34 of stem rust and its biotype in addition to resistance to flag smut and powdery mildew.

Yield data from three research stations show Dowerin to be favourable in this respect as compared with standard varieties at present under cultivation.

COST OF FEEDING PURE-BRED DAIRY COWS UNDER THE AUSTRALIAN OFFICIAL PURE-BRED HERD RECORDING SCHEME IN WESTERN AUSTRALIA, 1947-8.

M. CULLITY, Superintendent of Dairying.*

In 1924 a report under the above heading was issued from this Department and each year up to and including 1938-39 similar reports were prepared and published.

The object was to record as accurately as possible the wide range of feeding costs incurred by breeders of pure-bred dairy cattle, with a view to assisting in reducing unnecessary expenditure—partly by showing where purchases were unbalanced and by drawing attention to the effectiveness of full use of pasture, conserved fodder both as hay and silage, and farm grown fodder crops.

The pure-bred herds submitted for test are located over a wide area of the South-Western Division, extending 60 miles north of Perth and along the Great Southern Railway line, as well as through the main dairying districts.

The herds are therefore held under a wide range of climatic conditions and it is natural there is considerable variation in the cost of providing feed for producing both milk and butter-fat. As the climatic conditions vary, the type of agriculture also is not constant. Herds are operated under conditions having up to nine months of pasture and also in areas where the principal crop is wheat and the length of the effective pasture season not more than four or five months. It will be understood also that the cost of the various fodders which are produced, vary from farm to farm and in order to ensure that a comparison may be as equitable as possible, the rates adopted are the average wholesale market prices at Perth.

Since the last report published in 1940, the prices of most fodders have increased by relatively large amounts. However, in the rates which have been adopted, it will be seen that there is one noticeable exception. In previous reports, pasture was valued as follows:—

per head per week	.. ..	good green	2s. 6d.
per head per week	.. ..	dry	1s. 6d.

After full consideration, it has been decided to adopt the figure of 1s. 6d. per cow per week as a standard charge, as it is believed that the cost of providing pasture on a farm throughout the year would not exceed this figure. This will have the effect of making the average cost for 1947-48 appear lower than what would have been the cost had the previous rate been maintained or increased.

It is necessary to emphasise that there is no suggestion of a competition in preparing the following tables. To ensure this, the owners' names have been replaced by a herd letter. However any breeder who is anxious for the details of his own herd can procure the information by applying to the Department of Agriculture.

It is possible, owing to the method of collection that minor inaccuracies may be present, but the final result should be comparable between herd and herd and with allowance for the difference due to the valuation of pasture, between year and year.

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* Records by B. H. Drakes. Tabulations by A. Goldie.

Table 1 gives the prices of the feeding stuffs which were adopted in the calculations.

TABLE 1.

PRICES USED IN VALUATING THE FOODSTUFFS CONSUMED DURING THE YEAR ENDED 30TH JUNE, 1948.

	£	s.	d.
Chaff (per ton)	8	12	6
Wheat, crushed (per bushel)	0	7	6
Oats, crushed (per bushel)	0	6	0
Bran (per ton)	6	15	2
Pollard (per ton)	6	15	2
Branato (per ton)	6	15	2
Calf meal (per ton)	17	15	0
Sweet Dairy Meal (per ton)	11	12	6
Dairy Food (per ton)	12	17	6
Linseed Meal (per ton)	18	0	0
Meatmeal (per ton)	13	0	0
Meggitts Meal (per ton)	15	11	6
Hay (per ton)	6	0	0
Silage (per ton)	1	0	0
Green Feed (per ton)	1	0	0
Lick (per ton)	16	0	0
Bone Meal (per ton)	11	0	0
Pasture (per head, per week)	0	1	6

The average results which have been obtained for the 16 years—1924 to 1939, and in the most recent year, 1947-48, are set out in the following table.

TABLE 2.

PURE-BRED COWS UNDER OFFICIAL TEST—AVERAGE RESULTS OVER A PERIOD OF 17 YEARS.

Year ended 30th June.	Average Milk Yield per cow.	Average Butterfat per cow.	Average cost of feed per cow.	Average cost of feed to produce 1 lb. Butterfat.	Average cost of feed to produce 1 gallon Milk.	Average price Butterfat per lb.
	gallons	lbs.	£ s. d.	pence	pence	pence
1924	600	319·50	10 4 10	7·70	4·09	19·5
1925	652	308·59	14 13 2	10·77	6·15	17·5
1926	624	312·01	14 14 7	11·15	5·66	19·0
1927	602	290·72	14 10 5	12·00	5·79	19·0
1928	592	280·56	15 11 4	13·34	6·34	19 5
1929	629	295·10	15 1 0	12·24	5·74	20·0
1930	636	294·98	14 10 3	12·74	5·10	19·5
1931	643	301·60	9 14 7	7·74	3·64	16·0
1932	696	318·96	10 18 3	8·21	3·76	14·0
1933	664	308·60	9 2 3	7·08	3·29	11·0
1934	720	333·70	10 2 6	7·28	3·37	10·0
1935	682	326·61	9 18 0	7·34	3·49	12·5
1936	681	320·14	8 14 7	6·54	3·08	12·5
1937	685	309·31	11 5 1	8·73	3·94	14·5
1938	664	306·99	10 19 7	8·58	3·97	15·0
1939	681	310·13	10 13 7	8·26	3·76	16·0
1948	653	311·20	13 13 3	10·53	5·02	27·0

It will be noted that there has been an increase in cost compared to 1939, but this is not as great as would be expected, even when allowance is made for a reduction in pasture valuation, which probably would amount to 1d. per gallon or 2½d. per lb of butter-fat.

There is only a very slight increase in the yield of butter-fat and a small decrease in the average yield of milk.

The average cost of feeding to produce 1lb. butter-fat is assessed as 10.53d. while the cost for one gallon of milk is 5.02d.

BREEDS.

Previous reports provide a comparison between the efficiency of the breeds as economical producers of milk and butter-fat. This data has again been tabulated and the results for the three breeds officially tested in this State, the Jersey, the Guernsey and the Australian Illawarra Shorthorn, are shown in table 3.

TABLE 3.

BREEDS COMPARED AS PRODUCERS OF MILK AND BUTTERFAT.

Breed.	Average Milk per cow during 9 months.	Average Test	Average Butterfat per cow during 9 months.	Average cost of feed per cow.	Average cost of feed to produce 1 gallon Milk.	Average cost of feed to produce 1 lb. Butterfat.
	lbs.	%	lbs.	£ s. d.	pence	pence
A.I.S. (12 herds) .	7,001	3·85	269·83	16 4 6	5·55	14·80
Guernsey (8 herds) .	6,340	5·12	324·75	13 19 11	5·03	10·34
Jersey (20 herds) .	6,262	5·23	337·81	11 8 5	4·37	8·11

It will be noted that the Jersey breed on this occasion has the lowest cost of feed for producing both milk and butter-fat and that the Australian Illawarra Shorthorn has the highest cost for both.

This result is contrary to that obtained in previous years when the Jersey was the most successful in achieving the lowest cost for butter-fat and the Australian Illawarra Shorthorn had the distinction of the lowest cost for producing a gallon of milk. In the present table the Guernsey breed occupies the intermediate position between the Jersey and the Australian Illawarra Shorthorn. The explanation of the failure of the latter breed is probably in the relatively low average yield per cow achieved during the season.

It would normally be expected that the Jersey and Guernsey, being what are known as "butter-fat breeds" would be more economical producers of butter-fat but in considering the relative suitability of breeds of dairy cattle other factors must receive attention. The capacity for producing large quantities of milk, which is a characteristic of the Australian Illawarra Shorthorn makes it of special value in areas where milk is produced for consumption as such and is sold on a gallonage basis.

This breed also has a special value, even where butter-fat is sold by virtue of the additional quantity of skim milk which is available for feeding to pigs.

In addition, on larger properties where the owner has sufficient grazing to rear steers, the added return which may be obtained from this activity may more than balance the difference between the output of butter-fat of the shorthorn and the "butter-fat" breeds.

This comment should not be construed to mean that on small properties capable of carrying the dairy herd only, that the value of cull cows of the Shorthorn breed will outweigh the advantage of production of the butter-fat breeds. It is only in exceptional cases that such would be the case.

No attempt is being made here to recommend any breed, but the results are submitted for study by farmers.

"WET" VERSUS "DRY" AREAS.

The relative cost of producing milk or butter-fat in the heavy rainfall, or dairying, districts, compared with the drier areas of the State referred to earlier, is shown in table 4.

TABLE 4.

COST IN LIGHT RAINFALL AREAS COMPARED WITH THE SOUTH-WEST.

	Average Production per Cow.		Cost of Feed for—	
	Milk.	Butterfat.	1 gallon Milk.	1 lb. Butter-fat.
	lbs.	lbs.	pence	pence
Dry areas (10 herds)	6,767	346·59	5·59	11·60
Wet areas (30 herds)	6,458	299 56	4·69	10·11

It will be seen that the difference in the cost is not as great as would be expected.

It must be pointed out, however, that the difference is considerably less than the analyses of costs in a similar way for the previous years. This may be due to the fact that on this occasion the average yield of the herds in the dry areas has proved considerably higher than those in the heavy rainfall districts.

Table 5 places the herds in order of merit as profitable producers of butter-fat.

The average cost of producing 1lb. of butter-fat was 10.53d. Seventeen of the forty herds had a higher figure and it appears that the cost of producing 1lb. of butter-fat in many herds is too great. However this may not be a justifiable conclusion in view of the fact that 23 of the 40 herds showed a profit over the cost of feeding of more than £24 15s. 9d. which was the average for the 40 herds. Of these three had average costs per lb. of butter-fat greater that the average, and achieved the greater profit because of their high average butter-fat yield.

On the other hand, of the seventeen herds which had a profit over the cost of feeding of less than the average of £24 15s. 9d. three had average costs per lb. of butter-fat lower than 10.53d. Low average production per cow was responsible for the smaller profit. It therefore follows that high cost per lb. butter-fat does not necessarily limit profit as it may be offset by high yields. Again, low costs of feeding may not always be an advantage if they are the result of a low plane of feeding leading to low yields.

TABLE 5.

HERDS IN ORDER OF MERIT AS PROFITABLE BUTTER-FAT PRODUCERS.

Place.	Herd.	District (W = Wet) (D = Dry)	Breed.	Average Butter-fat per Cow for 9 months.	Available Skim Milk per Cow.	Value of Butter-fat per Cow at 2s. 3d. lb.	Value of Skim Milk per Cow at 2d. gal.	Gross Return from Butter-fat and Skim Milk per Cow.	Cost of Feed per Cow for 9 months.	Profit per Cow.	Cost of Feed to produce 1 lb. Butter-fat.
						£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	d.
1	AO	D	Jersey .	471·68	5,440	53 2 0	4 10 8	57 12 8	14 18 0	42 14 8	7·57
2	AR	W	Jersey .	453·59	5,600	51 1 6	4 13 4	55 14 10	13 0 6	42 14 4	6·87
3	AH	W	Jersey	454·11	5,560	51 1 6	4 12 8	55 14 2	13 2 6	42 11 8	7·93
4	E	W	Jersey ..	423·62	5,390	47 14 0	4 9 10	52 3 10	10 7 6	41 16 4	5·87
5	N	D	Guernsey...	386·28	5,470	43 8 6	4 11 2	47 19 8	10 2 6	37 17 2	6·29
6	AF	W	Jersey ...	390·39	4,540	43 17 6	3 15 8	47 13 2	10 13 6	36 19 8	6·57
7	O	W	A.I.S. ...	385·62	7,170	43 8 6	5 19 6	49 8 0	12 13 0	36 15 0	7·89
8	C	D	Jersey	424·85	4,740	47 16 3	3 19 0	51 15 3	15 8 0	35 17 3	8·69
9	V	W	Jersey	322·84	3,570	36 6 9	2 19 6	39 6 3	5 6 6	33 19 9	3·97
10	Y	W	Jersey ...	356·41	3,730	40 1 0	3 2 2	43 3 2	10 1 6	33 1 8	6·79
11	M	D	Guernsey..	432·18	5,440	48 12 0	4 10 8	53 2 8	21 8 6	31 14 2	11·90
12	F	W	Jersey ...	325·26	3,130	36 11 3	2 12 2	39 3 5	7 14 6	31 8 11	5·70
13	K	W	Guernsey...	335·61	4,250	37 13 9	3 10 6	41 4 3	10 3 6	31 0 9	7·26
14	H	W	Jersey	295·96	3,330	33 6 0	2 15 6	36 1 6	7 6 6	28 15 0	5·94
15	W	W	Jersey .	321·53	3,910	36 4 6	3 5 2	39 9 8	10 15 6	28 14 2	8·34
16	AJ	W	Jersey	255·66	2,600	28 16 0	2 3 4	30 19 4	2 18 6	28 10 0	2·74
17	AC	W	A.I.S. .	292·51	5,480	32 17 0	4 11 4	37 8 4	9 13 6	27 14 10	7·92
18	R	W	Guernsey .	343·26	3,870	38 11 9	3 4 6	41 16 3	14 5 6	27 12 9	9·98
19	AQ	W	Jersey ...	308·28	3,440	34 13 0	2 17 4	37 10 4	10 8 6	27 1 10	8·12
20	B	W	A.I.S. .	274·01	4,440	30 16 6	3 14 0	34 10 6	7 14 6	26 16 0	6·75
21	AN	W	Jersey ..	329·49	3,720	37 0 3	3 2 0	40 2 3	14 11 0	25 11 3	10·61
22	AG	W	Guernsey.	249·47	2,710	28 0 3	2 5 2	30 5 5	5 3 6	25 1 11	5·00
23	Z	D	A.I.S. .	305·80	5,260	34 8 6	4 7 8	38 16 2	13 18 6	24 17 8	10·92
24	S	W	Jersey ...	305·73	3,330	34 8 6	2 15 6	37 4 0	12 6 6	24 14 6	9·66
25	U	W	Guernsey ..	368·28	4,340	41 8 0	3 12 4	45 0 4	20 7 6	24 12 10	13·29
26	AD	W	A.I.S. ...	303·53	4,850	34 1 9	4 0 10	38 2 7	14 12 6	23 10 1	11·54
27	G	D	Jersey	353·12	4,120	39 14 3	3 8 8	43 2 11	20 6 0	22 16 11	13·80
28	Q	W	Jersey	297·07	3,110	33 8 3	2 11 10	36 0 1	13 8 6	22 11 7	10·85
29	L	D	Jersey	339·03	3,620	38 2 9	3 0 4	41 3 1	18 18 6	22 4 7	13·40

30	AB	W	Jersey	258·57	3,030	29 2 9	2 10 6	31 13 3	9 18 6	21 14 9	9·19
31	I	W	A.I.S. ...	251·78	4,270	28 4 9	3 11 2	31 15 11	10 15 6	21 0 5	10·26
32	AI	W	A.I.S. ...	296·83	5,530	33 8 3	4 12 2	38 0 5	17 14 6	20 5 11	14·32
33	P	D	A.I.S. ..	194·98	3,000	21 18 9	2 10 0	24 8 9	6 1 0	18 7 9	7·44
34	T	W	Guernsey....	258·50	3,020	29 2 9	2 10 4	31 13 1	15 0 6	16 12 7	13·92
35	AE	W	Guernsey. .	238·68	2,360	26 17 9	1 19 4	28 17 1	13 1 0	15 16 1	12·58
36	A	W	A.I.S. ...	210·35	4,030	23 12 6	3 7 2	26 19 8	11 9 0	15 10 8	13·08
37	AA	W	A.I.S.	279·18	4,470	31 7 9	3 14 6	35 2 3	20 6 0	14 16 3	12·74
38	X	W	A.I.S. .	255·06	4,260	28 13 9	3 11 0	32 4 9	18 3 6	14 1 3	17·10
39	J	W	Jersey ...	211·86	1,900	23 17 0	1 11 8	25 8 8	13 1 0	12 7 8	14·71
40	AK	D	A.I.S.	210·23	3,250	23 12 6	2 14 2	26 6 8	25 2 6	1 4 2	28·71
Average	....	....	....	311·20	4,140	35 0 0	3 9 0	38 9 0	13 13 3	24 15 9	10·53

The leading herd owned by Mr. M. B. Stott of Wickepin, showed a net profit of £42 14s. 8d. over feeding costs, the average per pound of butter-fat being 7.57d.

An example of uneconomic feeding in shown in the herd "AK" which, with an average yield of 210 lb. of butter-fat had an average cost of feeding of £25 2s. 6d., allowing a profit of £1 4s. 2d. The cost of producing 1lb. of butter-fat in this herd was 28.17d. In this case it is obvious that profit was sacrificed by injudicious feeding.

In the comment to Table 3, reference was made to the value of the "butter-fat breeds" in the economical production of butter-fat and therefore the fact that fifteen of the first sixteen herds were of Jersey or Guernsey breed was not more than would be expected.

The relative value of the breeds for producing milk, however is referred to later in the report when the value of the Australian Illawarra Shorthorn breed is emphasised.

The table also indicates the location of the various herds either as being in the "dry" or the "wet" areas. From a study of the results other breeders may be able to gain some knowledge as to the conditions in the various areas.

A general statement however, can be made, that it does not matter where the herd is located as long as efficient feeding is carried out. In such circumstances both high yields and low costs can be achieved.

In table 6 the same herds are arranged in order of merit in respect to the profit which can be made as milk producers.

The two leading herds are of the Australian Illawarra Shorthorn breed and are owned by Mr. B. W. Prowse and Mr. J. Marston respectively. Both are in the dairying areas and are grazed on good quality pasture. Not only were profits over the cost of feed high, £69 17s. and £57 3s. 2d. respectively, but the cost of feeding per gallon of milk was low, 3.33d. and 2.89d. respectively.

Owing to high yields compared to the Shorthorn herds the next five places in order of merit are occupied by a Guernsey and four Jersey herds. However, examining Table 5 in conjunction with Table 6 it will be seen that the Shorthorn breed appears in a more favourable light as producers of milk.

The publication of these figures is intended to help breeders in a study of feeding methods and to focus attention on the farm grown fodder as the cheapest and best general source of supplies. It is obvious from a study of the feeds used that too great a proportion of the herds are maintained on purchased fodder. While this may be justified where force of circumstances necessitates the keeping of a larger herd than farm sources will maintain; it generally reacts against the breeder by developing the thought in his neighbours and his customers that his cows are attuned to high concentrate feeding and may be uneconomical producers on a commercial farm.

TABLE 6.

HERDS IN ORDER OF MERIT AS PROFITABLE MILK PRODUCERS, 1947-48.

Place.	Herd.	Breed.	Average Milk per cow for 9 months.	Value of Whole Milk at 1s. 8d. per gallon.			Cost of Feed per cow for 9 months.			Profit per cow.			Cost of Feed to produce 1 gallon Milk.
			lb.	£	s.	d.	£	s.	d.	£	s.	d.	d.
1	O	A.I.S.	9,907	82	10	0	12	13	0	69	17	0	3·33
2	AC	A.I.S.	8,024	66	16	8	9	13	6	57	3	2	2·89
3	N	Guernsey	8,010	66	15	0	10	2	6	56	12	6	3·03
4	E	Jersey	7,920	66	0	0	10	7	6	55	12	6	3·14
5	AR	Jersey	8,151	67	18	4	13	0	6	54	17	10	3·83
6	AH	Jersey	8,112	67	11	8	13	2	6	54	9	2	3·88
7	AO	Jersey	7,976	66	8	4	14	18	0	51	10	0	4·48
8	Z	A.I.S.	7,777	64	15	0	13	18	6	50	16	6	4·44
9	AI	A.I.S.	8,075	67	5	0	17	14	6	49	10	6	5·27
10	B	A.I.S.	6,868	57	3	4	7	14	6	49	8	10	2·70
11	AF	Jersey	6,975	58	1	8	10	13	6	47	8	2	3·67
12	AD	A.I.S.	7,320	61	0	0	14	12	6	46	7	6	4·79
13	K	Guernsey	6,651	55	8	4	10	3	6	45	4	10	3·67
14	M	Guernsey	7,974	66	8	4	21	8	6	44	19	10	6·45
15	C	Jersey	7,191	59	18	4	15	8	0	44	10	4	5·14
16	I	A.I.S.	6,672	55	11	8	10	15	6	44	6	2	3·87
17	V	Jersey	5,895	49	1	8	5	6	6	43	15	2	2·16
18	A	A.I.S.	6,419	53	8	4	11	9	0	41	19	4	4·29
19	W	Jersey	6,273	52	5	0	10	15	6	41	9	6	4·12
20	Y	Jersey	6,075	50	11	8	10	1	6	40	10	2	3·98
21	H	Jersey	5,631	46	18	4	7	6	6	39	11	10	3·12
22	P	A.I.S.	5,261	43	16	8	6	1	0	37	15	8	2·76
23	R	Guernsey	6,237	51	18	4	14	5	6	37	12	10	5·49
24	F	Jersey	5,418	45	1	8	7	14	6	37	7	2	3·42
25	X	A.I.S.	6,665	55	10	0	18	3	6	37	6	6	6·54
26	AA	A.I.S.	6,901	57	10	0	20	6	0	37	4	0	7·06
27	AJ	Jersey	4,824	40	3	4	2	18	6	37	4	10	1·46
28	AQ	Jersey	5,751	47	18	4	10	8	6	36	19	10	4·35
29	AG	Guernsey	4,946	41	3	4	5	3	6	35	19	10	2·51
30	AN	Jersey	6,066	50	10	0	14	11	0	35	19	0	5·76
31	U	Guernsey	6,759	56	5	0	20	7	6	35	17	6	7·24
32	AB	Jersey	5,301	44	16	8	9	18	6	34	18	2	4·49
33	S	Jersey	5,634	46	18	4	12	6	6	34	11	10	5·25
34	G	Jersey	6,516	54	5	0	20	6	0	33	19	0	7·48
35	Q	Jersey	5,382	44	16	8	13	8	6	31	8	2	5·99
36	L	Jersey	5,958	49	11	8	18	18	6	30	13	2	7·63
37	T	Guernsey	5,286	44	0	0	15	0	6	28	19	6	6·82
38	AE	Guernsey	4,554	37	18	4	13	1	0	24	17	4	6·88
39	AK	A.I.S.	5,549	46	3	4	25	2	6	21	0	10	10·88
40	J	Jersey	4,048	33	13	4	13	1	0	20	12	4	7·75
Average	....	....	6,538	54	8	4	13	13	3	40	15	1	5·02

THE SUNFLOWER.

(*HELIANTHUS ANNUUS.*)

By H. G. ELLIOTT, Agrostologist.

THE sunflower originated in North America and to-day is grown extensively in the Argentine, North America, Russia and parts of Europe where the oil from the seed after extraction is used for industrial and domestic purposes, and the residual oil cake or meal has a stock food value on par with linseed meal.

Prior to and during the war, there was only a limited demand for seed in Australia, and this seed was mainly used in the bird seed trade, but the present shortage of vegetable oils has stimulated the interest in the growing of the crop in various States of Australia, principally Queensland.

The possible uses of sunflower seed oil have been classed as follows:—

(a) As an extender or partial substitute for linseed oil in the manufacture of paints and varnishes, but as sunflower oil is a semi-drying oil, paints made entirely from it have unsatisfactory drying rates, but the oil can be used as an extender.

(b) As an Edible Oil.—There is a demand for refined and deodorised sunflower oil as an edible oil in competition with such oils as peanut, maize, olive, cotton and soy bean. The main uses for these oils are for food preparations, food processing, culinary, dried fruit processing, and pharmaceuticals.

(c) Miscellaneous Uses.—There may be a demand for this oil in the manufacture of plasticising materials for the rubber trade, cosmetics and soap manufacture.

There are a number of processing plants in Australia, including Western Australia, which are not operating at full capacity and could process the seed.

Description of the Plant.

It is a hairy, erect and somewhat sparsely branched annual. It grows with rapidity to a height of 12 ft. (giant types) in two to three months, this being due to the plant's power of assimilation and translocation. The plant develops a strong taproot which can penetrate during its growing period to 9 ft.

Varieties and Oil Content.

There are numerous varieties of sunflowers grown commercially and, during recent years, the production of drawf growing varieties have gained prominence as they are suitable for mechanical harvesting.

The oil content of the seed varies according to the varieties, and ranges between 25 and 33 per cent., and one ton of seed produces in the vicinity of 440 lb. of oil.

Some of the more popular varieties and the oil content of the seed are as follows:—

Giant Varieties—	
Mammoth Russian	27-29 per cent. oil.
White and checkered seed	31-33 per cent. oil.
Semi Dwarf—	
Tournesol, Pole Star, Jupiter and Mars	25-30 per cent. oil.
Dwarf—	
Mennonite, Sunrise, Advance Hybrid	25-30 per cent. oil.

Price of Seed.

Prior to World War II, the price of seed was in the vicinity of £14 16s. per ton, and just prior to the commencement of hostilities it rose to £23 per ton. At the present time, the price in Australia varies from £32-£40 per ton.

Value of Residue.

The residue of the seed after oil extraction is a valuable protein rich concentrate for use for stock food. The analyses are as follows:—

Sunflower cake—45 per cent. protein, 10 per cent. oil.

Sunflower meal—35 per cent. protein, 2 per cent. oil.

Soil and Climate.

Sunflowers succeed best in relatively rich alluvial soils, but they can be grown with success on a large range of soils, from sandy loams through to medium-heavy loams. Generally speaking, for best results, conditions which will produce maize crops are suitable for sunflowers, with the exception that sunflowers are much more tolerant to cold than maize, and are more drought resistant. Some of the dwarf types of sunflowers will withstand 5 degrees of frost.

Fertiliser.

Under Western Australian conditions it has been found that on the average soils which have been under subterranean clover for a few years, good results have been obtained from the use of superphosphate at rates from 2-3 cwt. per acre, better results could be obtained by using potato manure B at the same rate per acre.

Soil Preparation.

When sunflowers are grown as a summer crop, the land should be ploughed as early as possible in the winter months and left in a rough state until spring, then worked down so that a good firm seed bed has been obtained.

Sunflowers are susceptible, however, to the ravages of both red mite and lucerne flea, and if sown as a winter and spring grown crop, control of these pests is essential. Weed control is also necessary, as in the early stages they may be retarded in growth by cold conditions.

Time of Sowing.

Sunflowers should be planted late enough to escape the cold in the spring. Mid September to early December will be found the most suitable months.

Method of Sowing.

The seed is usually sown in rows 2-3 feet apart and the single plants should be from 6-12 inches apart in the rows. The American system is to sow in rows 3 feet apart with the plant spaced 6-9 inches.

In America, experimental work carried out at Ithica showed that thicker plantings produced thin stems and these lodged readily. With thinner plantings, thick coarse stems are produced, which are heavy at the top, making handling difficult, if it is grown for silage.

Seeding can be carried out by using an ordinary standard seed drill, the seed being sown through the oat run in the drill box. Rate of seeding varies, from 3 to 8 lb. per acre, according to variety sown and width of drills. Two pounds of seed per acre are sufficient if rows 36in. apart and seed 18in. apart in the rows.

Time of Cutting for Silage.

It is advisable to cut the plants when the seed has reached the milky stage and before any of the leaves commence to drop. As these grow more rapidly than the maize, it may be necessary, if a maize-sunflower silage is required, to sow the sunflowers later than maize, so that both may reach a suitable stage for cutting at the same time. Most dwarf varieties, when sown in the spring, take approximately 90 days to reach this stage, whereas the giant types may take up to 120 days.

Yields.

In Russia they have reached approximately 50 bushels per acre. In the Argentine, in the vicinity of 900-1,000 lb. of seed are obtained per acre.

Experimental trials in this State indicate that in the higher rainfall areas, yields of up to 1½ tons with the dwarf varieties can be obtained. It is estimated that under commercial plantings, yields of up to ¾ ton should be obtained per acre.

Diseases.

Sunflowers are susceptible to rust, and this is known to be present in this State.

Harvesting.

Giant Types.—When sunflowers are to be harvested for seed production, with the giant types, the heads are cut off with about 6 inches of the stalk for ease of handling of the heads. The time they are harvested is when the seeds darken and harden and after the petals have fallen.

Heads, after harvesting, are then spread on floors or racks for drying, as they may heat if they are not stacked in this system, after harvesting. The seed is then knocked out with a flail, winnowed and then spread thinly to dry thoroughly.

Method of Thrashing.

Of the machines that have been tested, the modified maize sheller with a special Helise type drum has given by far the best performance, but the machine cannot deal with the stalks so that the heads must first be cut off. The great advantage of the maize sheller is that it is capable of removing all the seed from dried heads after stooking or ripe heads cut off the standing plants in the field.

Apart from the maize sheller, grain threshers with the American rasp bar type of drum are capable of removing 95 per cent. of the seeds from dried heads, providing the drum speed is reduced to 425 revolutions per minute, most of the concave bars removed and the drums set wide. Such machines are not suitable for undried heads.

For those people who wish to try sunflowers on a small scale, hand-threshing is not impracticable. The heads should be rubbed face downwards on a small mesh, expanded metal sheeting stretched tightly on a wooden frame, or on a wove wire small mesh, also on a wooden frame. It is estimated that one man can rub out more than 1 cwt. of seed in a day. In dealing with the stems left in the paddock from which the heads only have been cut off, these should be rolled down and immediately disced with tandem discs across the way of rolling before ploughing. For stooked plants, the simplest way is to burn the stems, but the ash should be spread carefully on the land because it is exceptionally rich in potash.

Dwarf Types.

These have been developed for mechanical harvesting and this type of harvesting is carried out in Canada, the Argentine, England and Australia.

In Australia, the following method is used when mechanically harvesting. Successful harvesting has been carried out by a modified header harvester when adjustments are made for the various makes of machines which have basically similar modifications as follows:—

Ground-driven or power machines can be used, but best results are obtained from the power types, as the machines can work at lower speeds for slow moving headers are less likely to knock the ripe plants which causes seed loss.

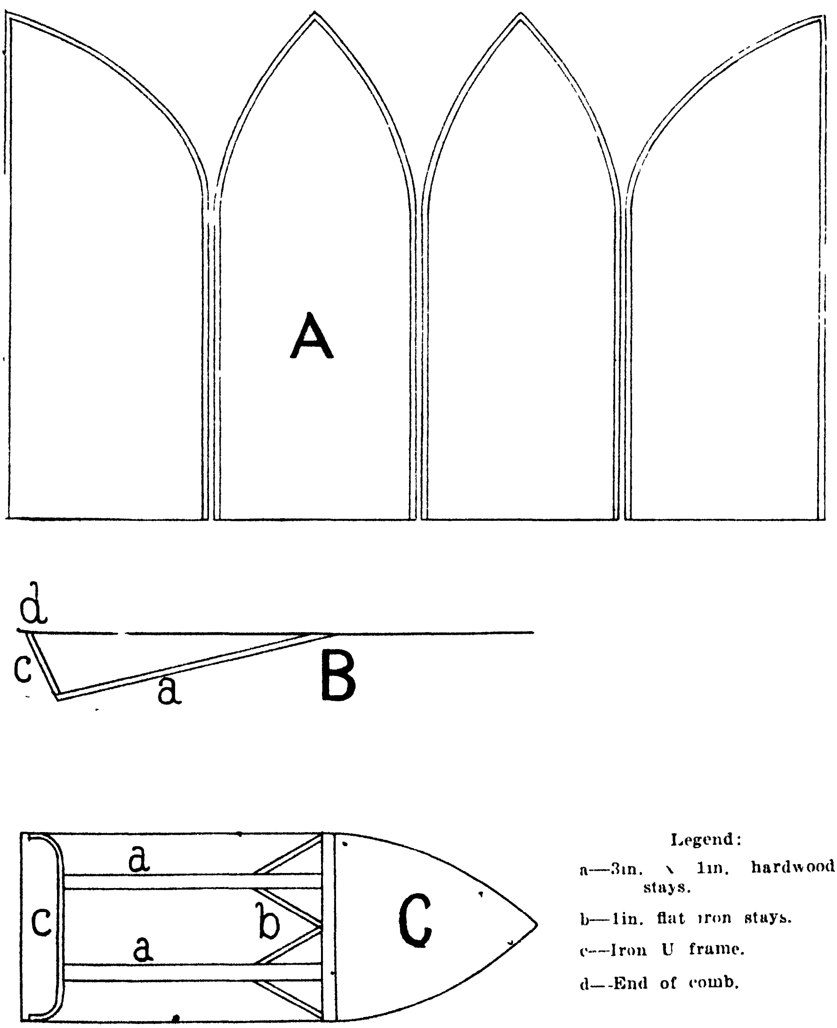


Diagram showing trays and their attachments.

A—Four trays 7½ft. long, 2¾ft. wide on a 12ft. header.
B and C—Showing how the tray is attached and stayed.

Modifications and adjustments are divided into five groups:—

1. Additions of trays and finger covers.
2. Comb.
3. Reel.
4. Threshing drum.
5. Minor adjustments.

(1) *Trays.*—The standard comb is covered by three or four large 20-gauge galvanised trays with an upturned lip of 1in. on all sides except the base, extending with a slight upward tilt to 7½ft. in front of the comb. These trays catch falling seed and seed heads and guide the stalks and seed heads on to the combs.

The ends of each tray are shaped into points so that the stalks can be guided into the knife.

The trays can be strengthened by the use of 1in. flat or angle iron to enclose the whole of the lipped edge.

The base of each tray is placed on the top of the fingers and attached by small bolts so that the basal edge of the tray just covers the cutting knife. Each tray is independently stayed underneath by means of wood and flat iron or by angle iron.

The finger covers are also made of 20-gauge galvanised iron and attached underneath each tray, each cover being approximately the same width as its corresponding tray to which it is attached about 1ft. in front of comb fingers.

(2) *Comb.*—Remove fingers in the spaces between the large trays and the erection of a guard strip of galvanised iron about 30in. high extending in an upright position from the front of the comb to about 4ft. along the outer edge of the tray nearest the elevator. This vertical guard helps keep the stalks on the trays and prevents them from falling on the machine itself.

(3) *Reel.*—This is raised about 1in. above normal setting. It may be necessary to drill fresh holes in both ends of the reel support in which the axle of the reel revolves. This extra clearance allows for the width of the stalks and clears the upturned lips on the edges of the trays.

(4) *Threshing Drum.*—A pea concave in lieu of the standard concave has been found the best—where the ordinary concave is in use, best results are obtained by removing the concave pegs from the concave floor.

(5) *Minor Adjustments.*—The blast can be reduced to a minimum and the length of the shake of the riddles may need adjustment, as usually the shorter the shake the more satisfactory the results.

When at work, the sunflowers fall on the trays, after being cut by the knife, and the general movement of the machine and the other incoming stalks and heads brush the whole mass back into the spirals, where it has a tendency to be broken up and therefore does not present any great trouble in actual threshing.

One of the greatest difficulties is that in some varieties the stalk is particularly tough and thick, and may cause front elevator trouble. Secondly, the long stalks will jam against the rear hood over the back of the walker case, but in view of the value of the crop, farmers are quite happy to put up with these minor troubles.

If there is only a small area to be harvested, the header can be used quite successfully as a stationary thresher, the heads being cut off with secateurs and fed in on a conventional threshing table. A plain concave should be used and also low speed on the drum.

[*Varieties Mainly Grown.*

Giant Russian.—A vigorous, robust growing variety attaining the height of up to 12ft. The seed is medium-sized, being either grey striped or black. It can be harvested by a header, but in heavy stands one or two rows only should be taken by the machine.

Mennonite.—A dwarf variety usually attaining a height of 3 to 3½ft., but under ideal conditions, up to 5½ft. Heads pendulous, which tend to lodge the plants if heavy rains occur near maturity. The heads are medium size and contain large elongated grey-striped seeds—suitable for header harvesting and a fairly heavy seed yielder.

Advance Hybrid.—This originated in Canada, grows from 3 to 4ft. high, with heads up to 8in. in diameter. The seeds are medium in size and grey striped.]

COMPOSITION OF MILK.

A preliminary investigation into the seasonal trend of chemical quality of milk from cows in a herd with a reputation for substandard fats and solids-not-fats.

M. CULLITY, Superintendent of Dairying.

J. C. HOOD, Deputy Government Analyst, Government Chemical Laboratories.

K. NEEDHAM, Agricultural Adviser, Dairy Laboratory.

OVER a period of many years punitive action has been taken against dairymen and vendors selling milk below the standard prescribed in the Food and Drug Regulations.

The contention in some of these cases was that the milk had been adulterated. In other cases where it was considered interference with the milk had not occurred, and therefore, it was admitted to be the natural product of the cow, farmers were given advice, which frequently suggested that the failure to feed a balanced ration was responsible for the trouble.

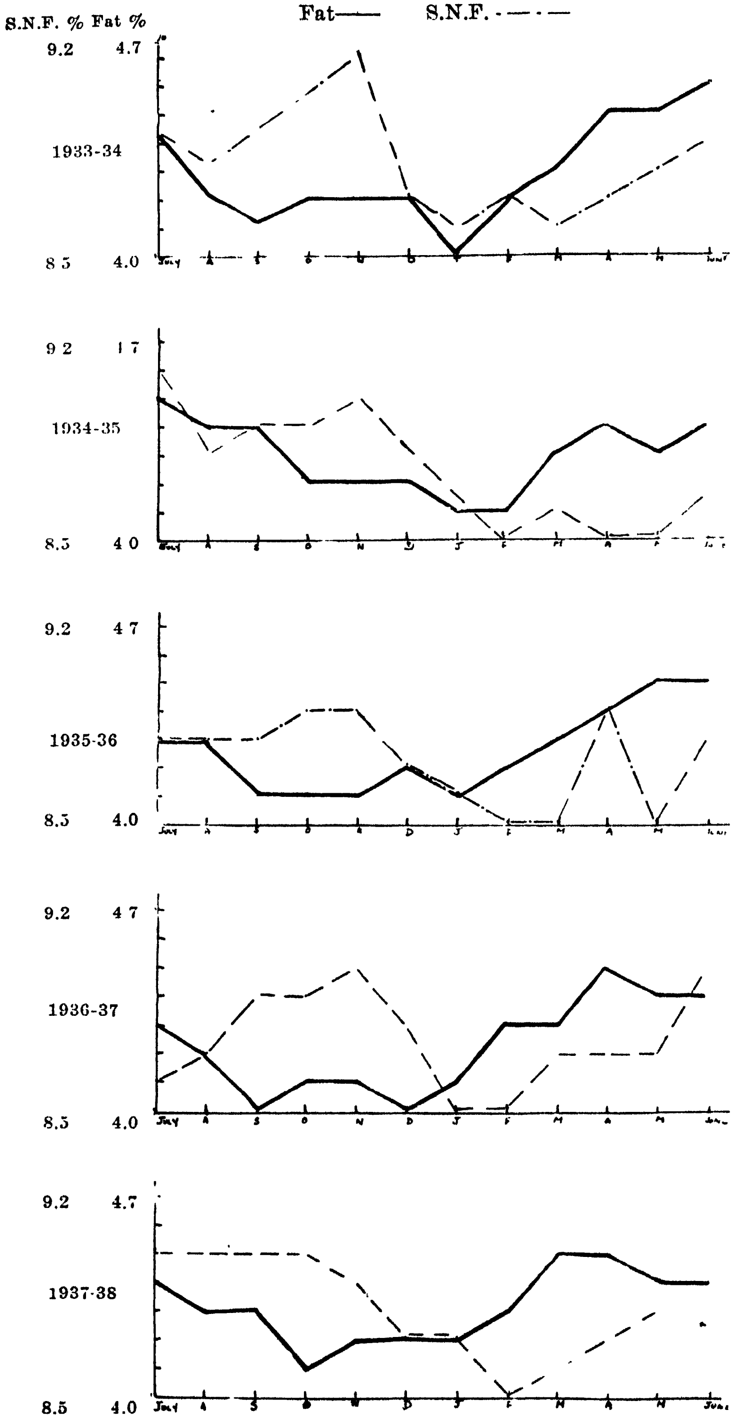
Occasionally, dogmatic advice to feed a certain grain was given as a means of improving quality.

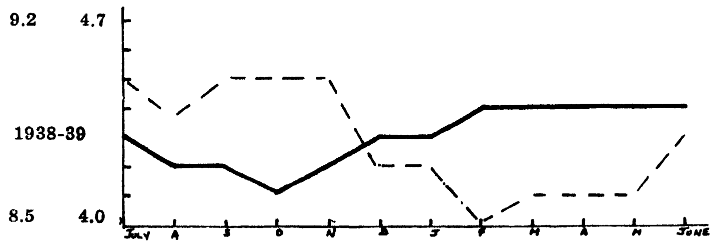
This attitude suggested that feeding was the only factor which could have an effect upon the quality of the milk and ignored variations in composition which may result from a large number of causes, for example those due to—

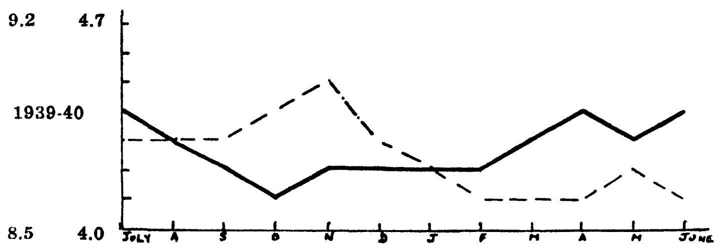
1. Breed.
2. Individuality of the cows.
3. Differences due to unequal periods between morning and evening milkings.
4. The effect of climate.
5. Gross under feeding.
6. The effect of udder disease.

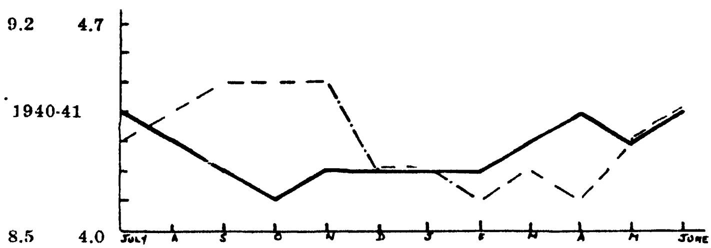
Evidence regarding the trend of composition of bulk milk received at a key dairy produce factory in the State shows considerable changes from season to season in each year, as illustrated by the following graphs of fat and solids-not-fat monthly averages over a period of 14 years from 1933-34 to 1946-47.

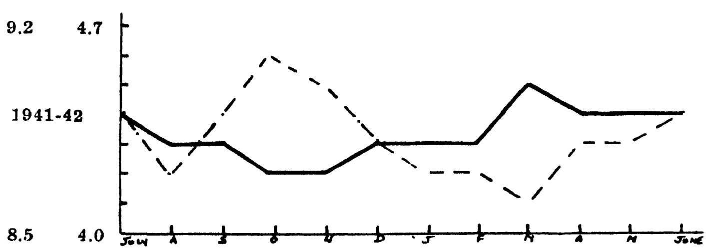
FAT and S.N.F. S-WEST FACTORY, 1933-1947.

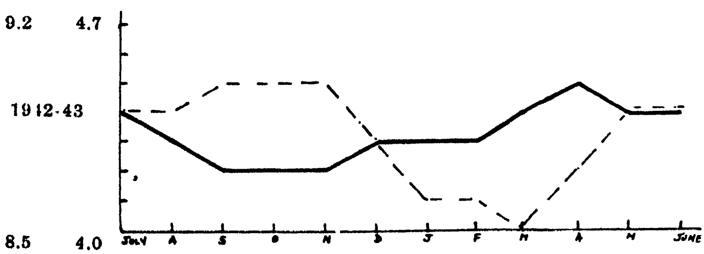


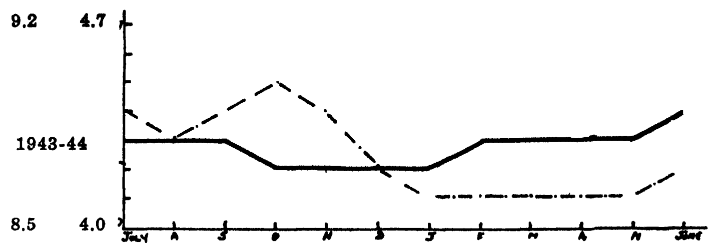

9.2 4.7
1938-39
8.5 4.0
JULY A S O N D J F M A M JUNE

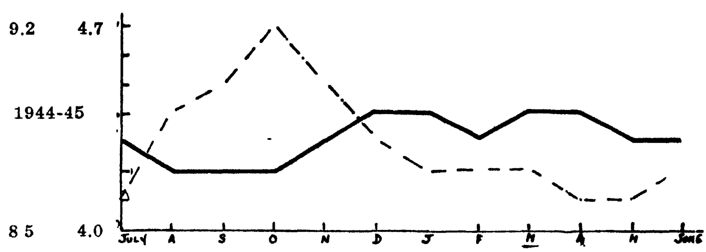

9.2 4.7
1939-40
8.5 4.0
JULY A S O N D J F M A M JUNE

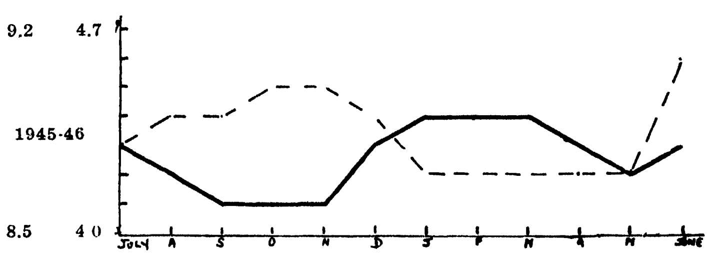

9.2 4.7
1940-41
8.5 4.0
JULY A S O N D J F M A M JUNE

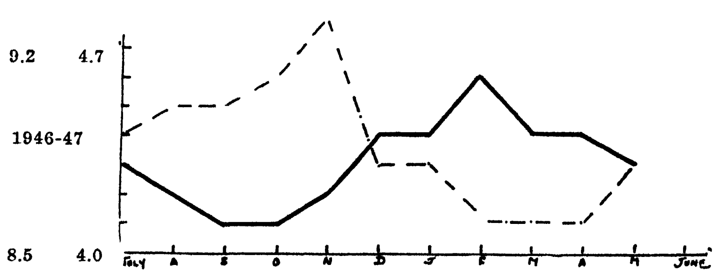

9.2 4.7
1941-42
8.5 4.0
JULY A S O N D J F M A M JUNE


9.2 4.7
1942-43
8.5 4.0
JULY A S O N D J F M A M JUNE









On some occasions the average value for solids-not-fats has coincided with the minimum standard laid down in the Food and Drug Regulations.

The highest percentage of butterfat occurred in the months of May to July while the lowest was during the period from October to February.

Percentages of solids-not-fat did not follow the same trend, but appeared to have an opposite movement, although in the graphs, the peaks did not coincide with the troughs of the fat, nor the troughs with the peaks of the fat.

The highest percentage of solids-not-fat occurred in the months of September to November, while the lowest values were in December to January. From November to February both fats and solids-not-fat were low. Thus the total effect was to make the chemical composition of the milk at its worst during this latter period.

It has been felt for some time that the factors responsible for the variations were not understood and at a meeting of the Inter-Departmental Technical Committee on Dairy Products* the matter was discussed and a decision made to carry out an investigation into the trend of composition of the milk of individual cows. This inquiry was intended as a preliminary to a possible further examination of the chemical standard of whole milk supplied generally in this State.

Owing to the difficulty of procuring supplies from commercial dairies, the bulk of which are using releaser type of milking machines the choice of a herd was restricted. The one finally selected was milked by hand, the owner having been prosecuted on numerous occasions for having sold under standard milk. This fact must be emphasised as it makes it impossible to consider the results obtained and described in this report as being applicable to the average milk received in the metropolitan area.

Examination of a Metropolitan Herd.

A dairyman made available at first six and later ten cows from his herd and on October 15, 1945, sampling was commenced, the number being increased to ten on the 29th October of the same year. These animals were selected by the owner as being a fair average sample of the herd. Details of the animals under test are as follow:—

Breed.	Age.	Date of last calving.	Period in milk months.
1 Favourite— Three Quarter Shorthorn	10 years	July, 1945	3½
2 Freda— Fresian	6 years	End of July, 1945	2½
3 Irene— Almost pure breed Shorthorn	6 years	Early September	1½
4 Marie— Pure Bred Fresian . .	10 years	July .	3½
5 Rosie— Fresian	10 years	July	3½
6 Susie— Fresian	6 years	July	3½
7 Josephine— By Shorthorn Bull out of Jersey Cross	4 years	End of August	1½
8 Nancy— Pure Breed Shorthorn	7 years	June	4½
9 Gwennie— Pure Breed Fresian .	7 years	July	3½
10 Roma— Mainly Shorthorn Balance Indeterminate	16 years .	Early September	1½

Sampling Technique and Hours of Milking.

Evening and morning samples were taken weekly as far as possible on Monday afternoon and Tuesday morning. The cows were hand milked and one of the authors taking the samples was present during milking. The milk was poured from the milker's bucket into the sampler's bucket immediately on completion of milking, weighed and sampled into an 8 oz. bottle with a long handled dipper. The evening samples were held over night in a refrigerator and were delivered to the laboratory for testing along with the morning samples by 10 a.m. No preservatives were added.

*Consisting of M. Cullity (Chairman), Department of Agriculture, J. C. Hood (Convener), Government Chemical Laboratories, Mr. Dowe, Public Health Department, Mr. J. Hoare, Government Chemical Laboratories, and Mr. K. Needham, Department of Agriculture.

Feed and Management.

No effort was made to alter the existing methods of management of the herd. In mid-December, 1945, the animals were on a ration composed of pollard, bran, branato and sweet dairy food. Added to this they received in the bail, chopped green feed in the form of paspalum and sub-clover and intermittently chopped spinach and brewers' grain.

During the summer months, although the animals were allowed free range between milking, green feed in the form of pasture was practically non-existent, and the picking of dry feed was sparse.

The nutritive ratio of the ration which was maintained until the middle of May was in the vicinity of 1 : 6, from the middle of May, 1946, the brewers' grains were reduced in volume to half, and from July the ration was still further widened by the elimination of the brewers' grain, and the reduction of the concentrates to half. There was, however, a slight increase in the volume of green feed supplied in the bail. From July until the conclusion of testing, October, 1946, this ration was maintained, and, owing to the poor grazing conditions during winter and spring, very little green feed was available as free grazing.

Sickness.

Throughout the 12 months period, the animals appeared to be in a fair condition, and suffered no apparent illness throughout the period under review. Upsets were confined to minor injuries of short duration. Subsequent to the completion of testing, the whole of the herd of this dairyman was subject to examination by the tuberculin test and it was found that a very high percentage of the herd gave a positive reaction. Enquiries revealed that four of the test animals, Nos. 4, 5, 7 and 10 were positive, but unfortunately no information could be obtained from the owner concerning the remainder. It is possible that these may have been disposed of prior to the tuberculin examination. According to a report of Sub-Committee of the Scientific Advisory Committee of the Department of Health for Scotland (i.) milk from tuberculous cows still gives normal freezing point depressions.

Chemical Examinations Made.

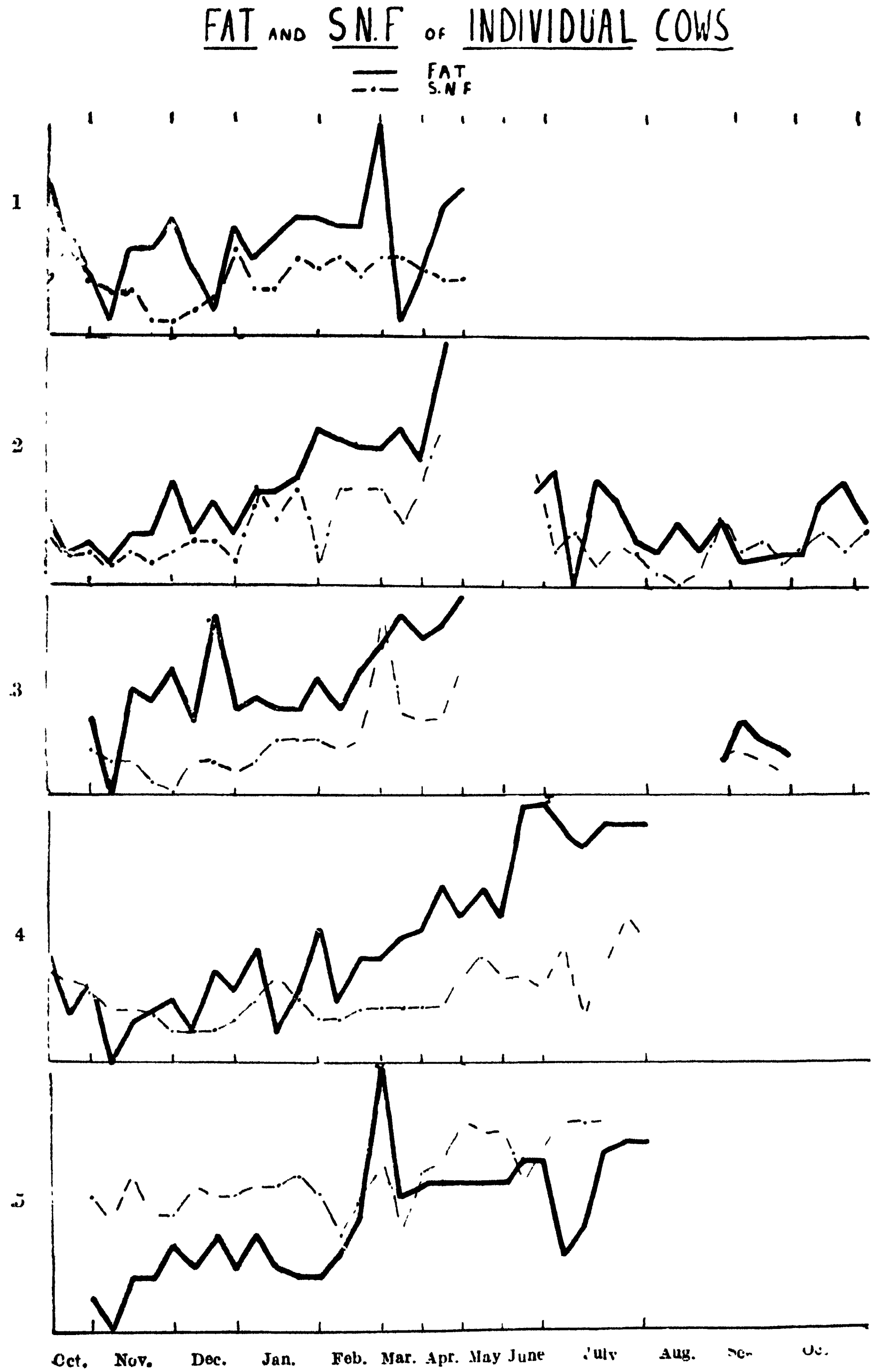
The samples were examined for fat, total solids, protein, lactose (by difference) ash, and freezing point depression. With respect to the freezing point depression, it was originally intended that individual examination would be made on each animal. However, it was necessary subsequently to discard this procedure and accordingly the a.m. and p.m. samples were bulked together and freezing point depressions were determined.

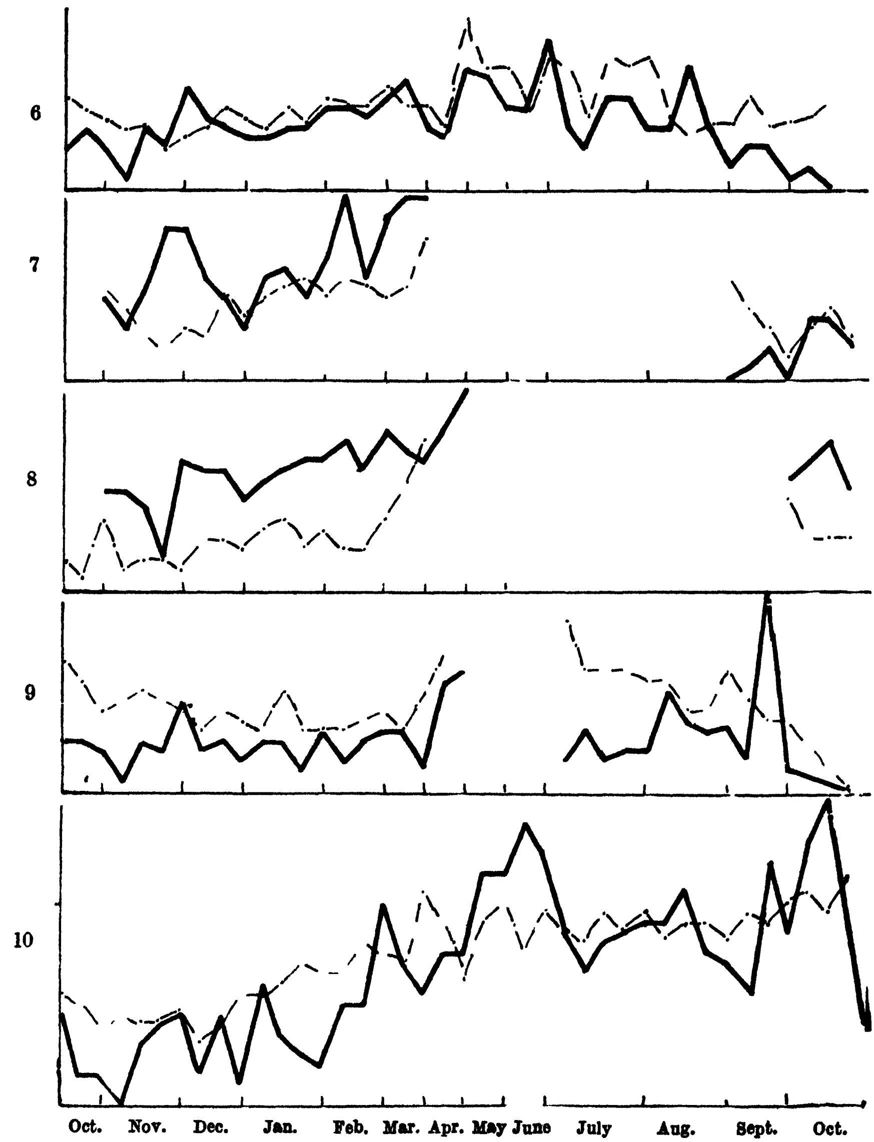
Fat.

The Food and Drug Regulations for Western Australia stipulate a minimum standard of 3.2 per cent. fat. Of the 576 examinations made 108 or 18.7 per cent. were below the minimum standard of 3.2 per cent. The average figure for the herd was 3.7 per cent. Of the total examinations made, 252 samples or 43.75 per cent. were above the herd average.

The graphs of the fat content for the individual animals, indicate a peak in February and March with a trough in October and November. The period of low fat content, corresponds fairly well with the information obtained from the factories in the South-West, although it occurs a little later. The peak, however, occurs considerably earlier in February and March as opposed to April and July in the South-West. With the exception of one cow all were more often than not above the minimum standard of 3.2 per cent. allowed.

(i) The freezing point (Hortvet) test of milk. Department of Public Health for Scotland—Report of Sub-Committee of the Scientific Advisory Committee, 1946.


FAT AND S.N.F OF INDIVIDUAL COWS
FAT
S.N.F
1
2
3
4
5
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
Aug.



Solids-not-fat.

The minimum standard required in the Food and Drug Regulations for the solids-not-fat is 8.5 per cent. and 307 or 53.3 per cent. of the samples failed to measure up to this requirement. The herd average was 8.53 per cent. of which 252 or 43.75 per cent. were above the average.

The graphs indicate the peak in the solids-not-fat in February and April, with the lowest peak in the solid-not-fat in almost the exact opposite of the condition obtained in the South-West irrigation areas.

Of the 10 cows, four have been consistently below the minimum standard for solids-not-fat, five have been irregular and only one has been consistently above the standard.

Freezing Point Depression.

The Western Australian standard for freezing point depression is -0.540°C. That recommended by the Scottish Ministry of Health is -0.530°C.(2) and in the following tables the results have been compared against both standards.

The following table shows the results of the 44 samples which it was possible to subject to individual cryoscope examinations and the relationship of this to the solids-not-fat content.

TABLE No. 1.

FREEZING POINT DEPRESSION ON INDIVIDUAL SAMPLES.

No. of Samples.	Solids not fat, less than 8·5%.	Freezing Point Depression less than —0·540°C.	Freezing Point Depression less than —0·530°C.
44	24 (54·9%)	29 (65·9%)	9 (20·4%)

TABLE No. 1A.

A.M.

No. of Samples.	Solids not fat, less than 8·5%.	Freezing Point Depression less than —0·540°C.	Freezing Point Depression less than —0·530°C.
22	13 (59·1%)	16 (72·7%)	8 (36·4%)

TABLE No. 1B.

P.M.

No. of Samples.	Solids not fat, less than 8·5%.	Freezing Point Depression less than —0·540°C.	Freezing Point Depression less than —0·530°C.
22	11 (50·0%)	13 (59·1%)	1 (4·5%)

Of these samples 54.9 per cent. (24) were low in solids-not-fat and 65.9 per cent. gave a freezing point depression lower than -0.540°C. and 20.4 per cent. (9) were less than -0.530°C. From tables 1A and 1B it will be seen there is a tendency for both the freezing point depression and the solids-not-fat to be below standard in the a.m. samples.

It is interesting to observe that the Scottish Ministry of Health[2] stated that only on rare occasions will the samples normally low in solids-not-fat show a lowered freezing point depression.

TABLE No. 2.

FREEZING POINT DEPRESSION OF INDIVIDUAL SAMPLES LESS THAN 8·5 PER CENT. SOLIDS NOT FAT, IN TABLES 1, 1A, 1B, ABOVE.

A.M. AND P.M.

Solids not fat, less than 8·5 %.	Freezing point depression, less than —0·540°C.	Freezing point depression less than —0·530°C.
24	19 (79·1%)	7 (29·1%)

[2]Liquid Milk and Nutrition. The freezing point test in the Australian Milk and Dairy Products Journal, December, 1945, page 25.

TABLE NO. 2A.

A.M.

Solids not fat, less than 8·5 %.	Freezing point depression less than —0·540°C.	Freezing point depression less than —0·530°C.
13	11 (84·5%)	7 (53·9%)

TABLE NO. 2B.

P.M.

Solids not fat, less than 8·5%.	Freezing point depression, less than —0·540°C.	Freezing point depression less than —0·530°C.
11	8 (72·7%)	*Nil*

Tables 2, 2A and 2B demonstrate that of the 24 samples which were below 8.5 per cent. solids-not-fat, 79.1 per cent. (19) showed a freezing point depression of less than -0.540°C. and 29.1 per cent. (7) less than -0.530°C. with the greater number below standard occurring in the a.m. group.

TABLE NO. 3.

FREEZING POINT DEPRESSION OF BULK SAMPLES.

A.M. AND P.M.

No. of Samples.	Solids not fat, less than 8·5%.	Freezing Point Depression less than —0·540°C.	Freezing Point Depression less than —0·530°C.
73	33 (45·2%)	64 (87·6%)	34 (47·9%)

TABLE NO. 3A.

A.M.

No. of Samples.	Solids not fat, less than 8·5%.	Freezing Point Depression less than —0·540°C.	Freezing Point Depression less than —0·530°C.
36	16 (44·4%)	33 (91·6%)	26 (72·2%)

TABLE NO. 3B.

P.M.

No. of Samples.	Solids not fat, less than 8·5%.	Freezing Point Depression less than —0·540°C.,	Freezing Point Depression less than —0·530°C.
37	17 (45·9%)	31 (83·8%)	9 (24·3%)

Tables 3, 3A and 3B show that whilst there is little appreciable difference between the a.m. and p.m. incidence of low solids-not-fat the percentage of low freezing point depression is greater in the a.m. samples as was the case with the individual freezing point depression determinations.

TABLE No. 4.

FREEZING POINT DEPRESSION OF BULK SAMPLES LESS THAN 8·5% SOLIDS NOT FAT, IN TABLES NOS. 3, 3A, AND 3B, ABOVE.

A.M. AND P.M.

Solids not fat, less than 8·5%.	Freezing point depression, less than —0·540°C.	Freezing point depression less than —0·530°C.
33	27 (81·8%)	11 (33·3%)

TABLE No. 4A.

A.M.

Solids not fat, less than 8·5%.	Freezing point depression less than —0·540°C.	Freezing point depression less than —0·530°C.
16	14 (87·5%)	9 (56·3%)

TABLE No. 4B.

P M.

Solids not fat, less than 8·5%.	Freezing point depression less than —0·540°C.	Freezing point depression less than —0·530°C
17	13 (76·5%)	2 (11·8%)

It should be remembered that the possibility of adulteration of the samples must be excluded, as in all instances they were taken under the observation of one of the authors.

It appears from the foregoing, therefore, that normally occurring low solids-not-fat samples will not necessarily give a normal freezing point depression.

Protein, Lactose and Ash.

With reference to the examinations made for protein, lactose and ash, no standards are laid down under regulation in Western Australia. For purposes of comparison the following average figures were used. Protein 3.43 per cent., lactose 4.75 per cent. and ash 0.72 per cent. The corresponding herd averages for the 10 cows under test were protein 3.11 per cent., lactose 4.68 per cent. and ash 0.73 per cent.

TABLE No. 5.

PROTEIN.

A.M. AND P.M.

——	Less than 3·43%	Greater than 3·43%	3·43%
No. of samples	425	146	5
Percentage	73·8	25·3	0·9

TABLE No. 5A.
A.M.

—	Less than 3·43%	Greater than 3·43%	3·43%
No. of samples	215	68	3
Percentage	75·2	23·8	1·0

TABLE No. 5B.
P.M.

—	Less than 3·43%	Greater than 3·43%	3·43%
No. of samples	211	77	2
Percentage	72·8	26·6	0·6

TABLE No. 6.
A.M. AND P.M.

—	Less than 3·11%	Greater than 3·11%	3·11%
No. of samples	286	282	8
Percentage	49·7	49	1·0

TABLE No. 6A.
A.M.

—	Less than 3·11%	Greater than 3·11%	3·11%
No. of samples	145	136	5
Percentage	50·7	47·6	1·7

TABLE No. 6B.
P.M.

—	Less than 3·11%	Greater than 3·11%	3·11%
No. of samples	143	144	3
Percentage	49·3	49·7	1

Table 5 illustrates the position using the average figure of 3.43 per cent. and Table 6 using the herd average of 3.11 per cent. Table 5 shows that 73.8 per cent (425) of the samples were lower than average, and 286 or 49.7 per cent. lower than the herd average.

TABLE NO. 7.

LACTOSE.

A.M. AND P.M.

—	Less than 4·75%	Greater than 4·75%	4·75%
No. of samples	305	263	8
Percentage	53	45·7	1·3

TABLE NO. 7A.

A.M.

—	Less than 4·75%	Greater than 4·75%	4·75%
No. of samples	143	140	3
Percentage	50	49·0	1

TABLE NO. 7B.

P.M.

—	Less than 4·75%	Greater than 4·75%	4·75%
No. of samples	163	122	5
Percentage	56·2	42·1	1·7

TABLE NO. 8.

A.M. AND P.M.

—	Less than 4·68%	Greater than 4·68%	4·68%
No. of samples	271	302	3
Percentage	47	52·4	0·5

TABLE NO. 8A.

A.M.

—	Less than 4·68%	Greater than 4·68%	4·68%
No. of samples	129	157	*Nil*
Percentage	45·1	54·9	..

TABLE NO. 8B.

P.M.

—	Less than 4·68%	Greater than 4·68%	4·68%
No. of samples	146	141	3
Percentage	50·4	48·6	1·0

Tables 7 and 8 show results of the lactose determinations using averages of 4.75 per cent. and 4.68 per cent. respectively. In the case of the lactose 53 per cent. or 305 samples were below the average of 4.75 per cent and 271 or 47 per cent. below the herd average of 4.68 per cent.

TABLE No. 9.

ASH.

A.M. AND P.M.

——	Less than 0·72%	Greater than 0·72%	0·72%
No. of samples	225	299	51
Percentage	39·1	52·0	8·9

TABLE No. 9A.

A.M.

——	Less than 0·72%	Greater than 0·72%	0·72%
No. of samples	123	129	34
Percentage	43·0	45·1	11·9

TABLE 9B.

P.M.

——	Less than 0·72%	Greater than 0·72%	0·72%
No. of samples	103	170	17
Percentage	35·5	58·6	5·9

TABLE No. 10.

A.M. AND P.M.

——	Less than 0·73%	Greater than 0·73%	0·73%
No. of samples	273	263	40
Percentage	47·2	45·7	6·9

TABLE No. 10A.

A.M.

——	Less than 0·73%	Greater than 0·73%	0·73%
No. of samples	184	77	25
Percentage	64·3	26·9	8·8

TABLE No. 10B.

P.M.

—	Less than 0·73%	Greater than 0·73%	0·73%
No. of samples	120	153	17
Percentage ..	41·4	52·8	5·8

Tables 9 and 10 set out the position in respect to ash using an average of 0.72 per cent. and a herd average of 0.73 per cent. Here, 39.1 per cent. or 225 of the samples were less than 0.72 per cent and 273 or 47.2 per cent. were less than 0.73 per cent.

Herd Averages.

It is interesting at this stage to compare the position of the herd averages in respect to the standards prescribed by the Food and Drug Regulations of Western Australia and the averages used for comparative purposes.

—	Herd Averages.	Food and Drug Standard and comparative averages.
	%	%
Fat . . .	3·73	3·2
Solids not fat .	8 53	8·5
Total Solids	12 26	11·7
Protein .	3 11	3 43
Lactose	4·68	4·75
Ash .	0·73	0 72

It will be seen that the herd averages for fat, solids-not-fat and ash are above the Food and Drug Regulations and comparative averages, but that the protein and lactose are below them.

CONCLUSIONS.

The results obtained indicate the following:—

1. Despite the fact that the herd average for fat and solids-not-fat is above the minimum standards prescribed by the Food and Drug Regulations, at certain times of the year, the fat and solids-not-fat are seriously under standard.
2. There is a seasonal variation in the chemical composition of the milk.
3. Many of the samples fail to meet the requirements of the freezing point depression standard.
4. The claim that the freezing point depression will be normal in normally low solids-not-fat samples is not borne out.
5. The herd average for protein is low.
6. The herd average for lactose is low.
7. The herd average for ash is satisfactory.

The authors of the above and the Inter-Departmental Technical Committee desire to point out that the results of this examination are not being taken as being indicative of milk quality throughout Western Australia. They referred simply to data obtained over a period of 12 months from the examination of 10 cows in one of the herds which was known to be producing substandard milk, which later was found to be heavily infected with tuberculosis.

The inquiry was intended merely as a preliminary to disclose the necessity for further and more extensive investigation. This, when practicable, will need to cover a more representative sample of the dairy herds and to test the effect of many varying conditions under which milk is produced.

C.S.I.R. INFORMATION SERVICE.

CHANGE OF ADDRESS.

Readers are advised that the C.S.I.R. Information Service has changed its address and is now located at C.S.I.R. Head Office,

314 ALBERT STREET, EAST MELBOURNE, C.2.
Telephone J.A. 6611.

THE COOLING OF MILK ON DAIRY FARMS.

A. H. HOBBS, H.D.D., Dairy Produce Inspector.

REGULATIONS under the Dairy Industry Act have recently been gazetted which provide for the compulsory grading, and payment for, according to grade, of all milk supplied to dairy produce factories in this State for manufacturing purposes.

The primary object of this legislation is to induce dairy farmers to supply milk of the best possible quality, and thus bring about an improvement in the finished product.

It is common knowledge that the bacteria responsible for the deterioration of milk, multiply most rapidly at the temperature at which the milk leaves the cow, (appoximately 98°F.). This applies more particularly to those types which produce undesirable flavours and odours by their action on the milk constituents.

Investigations have shown that over a period of nine hours the approximate increase in the number of bacteria in milk is as follows:—

Held at	Increase
60°F	each organism increases to 5
77°F	each organism increases to 107
95°F	each organism increases to 3800

Thus it can be seen that if the temperature of the milk is allowed to remain at the blood temperature of the cow, the increase in bacterial development will be extremely rapid.

As the temperature decreases, bacterial action is retarded until a stage is reached as the temperature approaches freezing point where the organisms are virtually dormant.

The aim of the milk producer then should be to reduce promptly the temperature of his product to as low a figure as possible immediately it is drawn from the cow, in an endeavour to ensure that the milk will command the maximum price when delivered to the factory.

In addition to cooling the milk when freshly drawn, it is essential that it be kept cool. Morning milk promptly cooled and delivered early should be in good condition on arrival at the factory. Milk produced in the evening and held overnight on the farm must be kept at a low temperature. Therefore in addition to cooling it as it comes from the cow, some means of maintaining this low temperature is necessary otherwise in warm weather it will soon return to the temperature of the atmosphere.

Experiments have shown that water will conduct heat approximately twenty-one times as fast as air. This means that by allowing the milk to come in contact with a water cooled metal surface, the milk will be cooled twenty-one times faster than if allowed to stand in air at the same temperature.

Unfortunately during the summer months supplies of cold water are not always readily available on dairy farms. A survey carried out by the author for the inter-departmental committee on milk quality during March, 1945, revealed that on forty-three farms taken at random between Perth and Brunswick, the average temperature of well water being used for cooling milk was 74°F. The lowest temperature recorded was 64°F, in which case the water was pumped direct from the well to the surface cooler. Temperatures as high

as 92°F were recorded where water was stored in unprotected overhead tanks during the day. It is obvious that any attempt to cool milk with water as mentioned in this latter case would be worthless.

Without the aid of mechanical refrigeration great reduction in the temperature of the milk is not possible; but with water at 65-70°F a reduction of at least 25°F can be obtained, which at all times, and particularly during the warmer portion of the year, is most beneficial.

If water is available at this temperature, and the well is adjacent to the milk room, the most effective method is to couple the pump direct to the cooler. If this is not practicable and the water has to be held in an overhead tank it will absorb heat and some means of cooling it prior to use is essential.

Apart from mechanical refrigeration, the only method by which water can be cooled on the farm is by natural evaporation using a specially constructed cooling tower.

The lowest temperature possible by this means is the wet-bulb temperature existing at the time in the vicinity.

The following figures for wet-bulb temperatures obtained from the weather bureau indicate the degree to which water may be cooled by the evaporative method in the areas given:—

AVERAGE WET-BULB TEMPERATURES OF 1946.

MONTH	PERTH		BUNBURY		MANJIMUP	
	9 a.m.	3 p.m.	9 a.m.	3 p.m.	9 a.m.	3 p.m.
January	60·2	64·5	60·0	64·2	57·2	None Available.
February	59·1	63·9	56·9	63·3	55·5	do.
March	58·3	65·2	57·5	65·0	53·6	do.
April	57·0	62·7	57·4	63·4	54·5	do.
May	54·8	58·7	54·6	58·7	51·2	do.
June	50·2	55·2	49·6	56·4	48·3	do.
July	51·4	54·1	51·5	54·4	47·2	do.
August	49·9	53·5	49·4	54·2	46·5	do.
September	57·1	57·1	52·4	56·7	50·5	do.
October	59·9	59·9	55·1	58·2	53·2	do.
November	59·5	59·5	56·6	60·1	53·6	do.
December	61·1	62·9	59·7	63·9	57·5	do.
Average for 1946	55·6	59·6	55·0	59·9	52·4	do.
ANNUAL AVERAGE	50 57·2	years 60·4	44 57·8	years. 61·7	.	do.

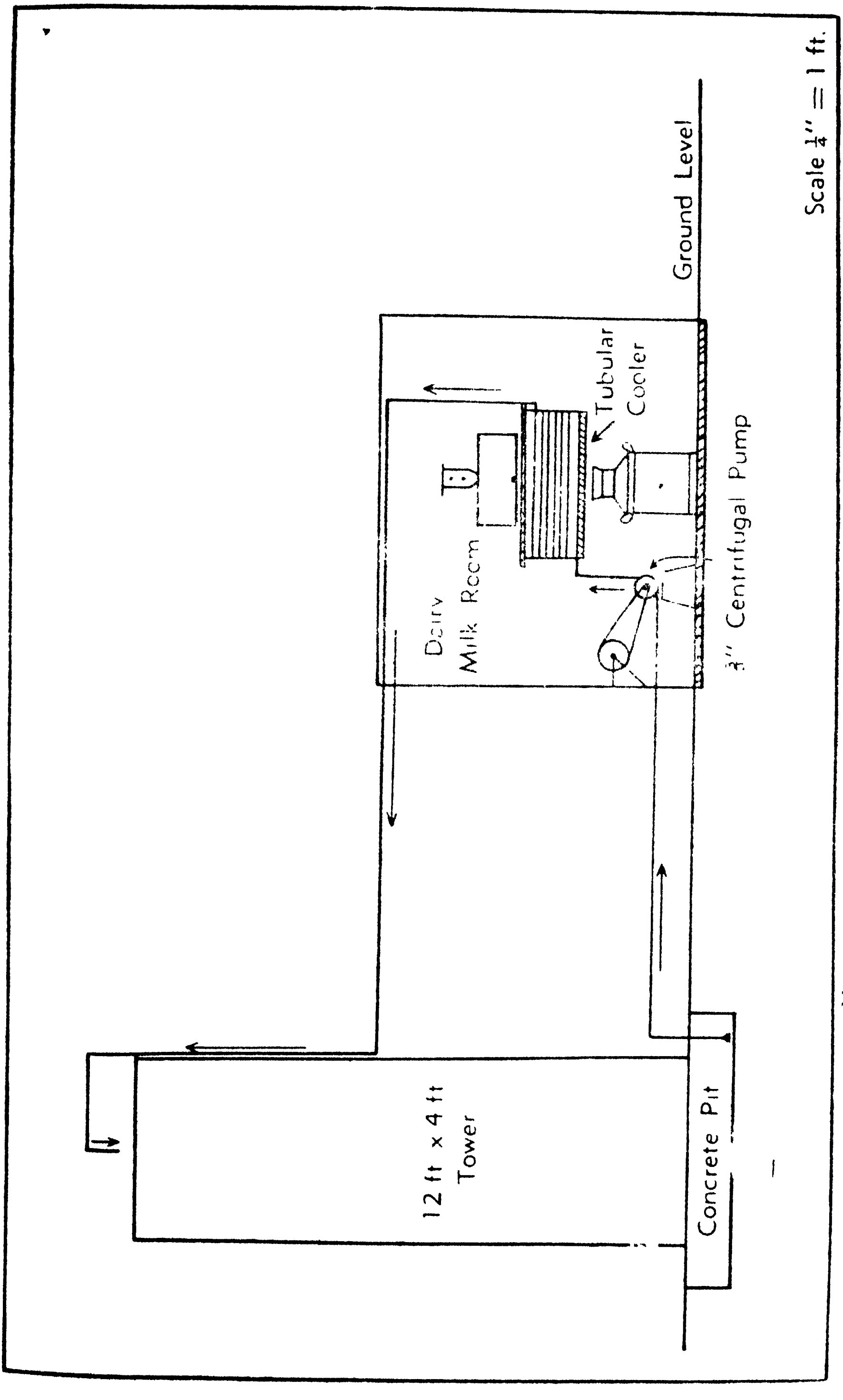


Plate 1 – Showing circulation system using a water cooling tower.

It will be seen that all times of the year in these areas the wet-bulb temperatures are not above 65°F, therefore it is possible with a properly constructed tower, to cool water to this figure even on the hottest day likely to be encountered in the dairying areas in this State.

The following description by F. G. Few, Division of Dairying, Department of Agriculture, Queensland, Queensland Agricultural Journal, May, 1946, illustrates a water cooling system suitable for the average dairy farm which can be expected to give the maximum cooling effect possible by this method. "Plate 1 shows the general arrangement of the tower re-circulated water cooling system. The water is drawn from the 1ft. deep concrete pit below the tower by means of a ¾in. centrifugal pump driven from the dairy house mainshaft as shown.

The water is pumped through the tubular surface cooler and finally delivered for re-cooling at the top of the tower. The tower is placed away from the dairy building to ensure the proper ventilation essential for water-cooling. It should be located on the side of the building exposed to the prevailing winds during the summer months, but need not be far away provided free air access on its four sides is assured. The amount of water needed for re-circulation is not large, and the pit shown on the tower drawings will hold ample water (approximately 200 gallons). A deep pit is not advisable. Tests have shown that water leaving the tower is generally cooler than a larger volume of water in a deep pit, and hence, on mixing, the water leaving for the cooler is higher in temperature than need be. Only sufficient water to properly cover the foot valve is required. The other advantages of a shallow pit are ease of cleaning, safety where children are present, and a greater rate of circulation due to the much smaller suction lift. The cost of construction of a deep pit is also an item of importance, especially if made throughout of concrete, and results have shown that it is no advantage from the viewpoint of efficient cooling.

MATERIALS FOR CONSTRUCTION OF TOWER.

All timber is of undressed hardwood and required concrete made of 4:2:1 mixture. The water distribution tray as shown is preferably of plain galvanised iron with 3in. sides and perforated over its whole base area, although it can be made of boards (6in. by ½in.) closely butted together and with ½in. holes bored along the centre of each board. The timber required is as follows:—

Tower uprights: Four 3in. x 3in., 15ft. long.

Louvres: Start 2ft. from ground level and spaced 5in. apart vertically; 25 are required for each side or 100 for the complete tower. They are of 6in. by ½in. hardwood and are 3ft. 4¾in. in length. Each louvre extends across the 3in face of the holding 3in. by ⅝in. batten strip resulting in a vertical overlap of ⅝in. and 1½in. measured along the louvre. Eight lengths of battening each 10ft. long are required to hold the louvres.

Tower bracing: Of 3in. by ⅝in. battening. Eight pieces each 7ft. long are required.

Baffles: Made of 6in. by ½in. hardwood. Five are required for each complete baffle, each board being 3ft. 4in. long. For the four sets of baffles twenty such boards are thus required.

The baffle boards are nailed to cross supports, two of 3in. by 1½in. hardwood and 3ft. 6in. long being required for each complete baffle. Similarly these are flushed into the two 3in. by 1½in. supports, each 4ft. long bolted to the tower upright.

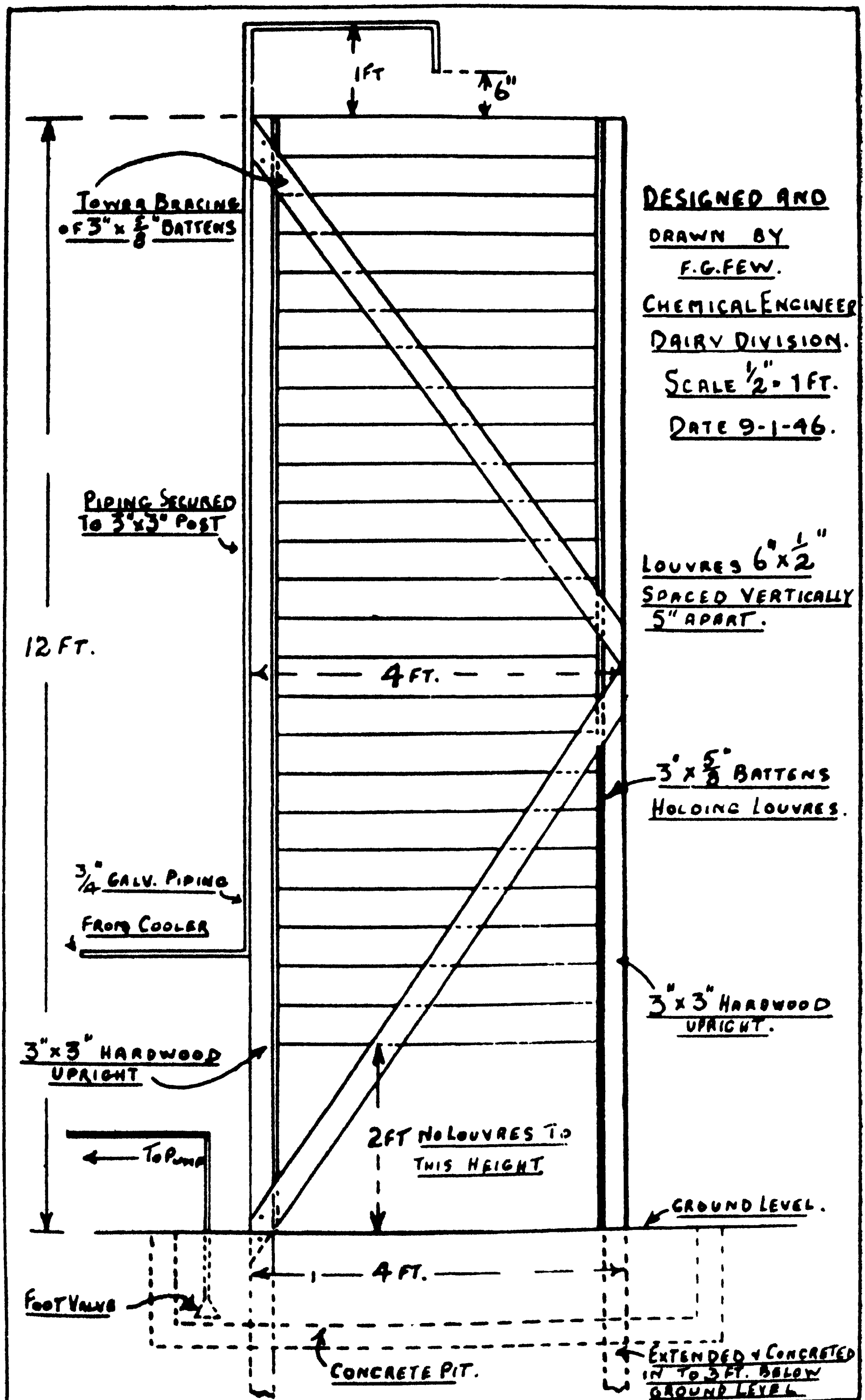


Plate 2.
Elevation of 4ft. square water cooling tower.

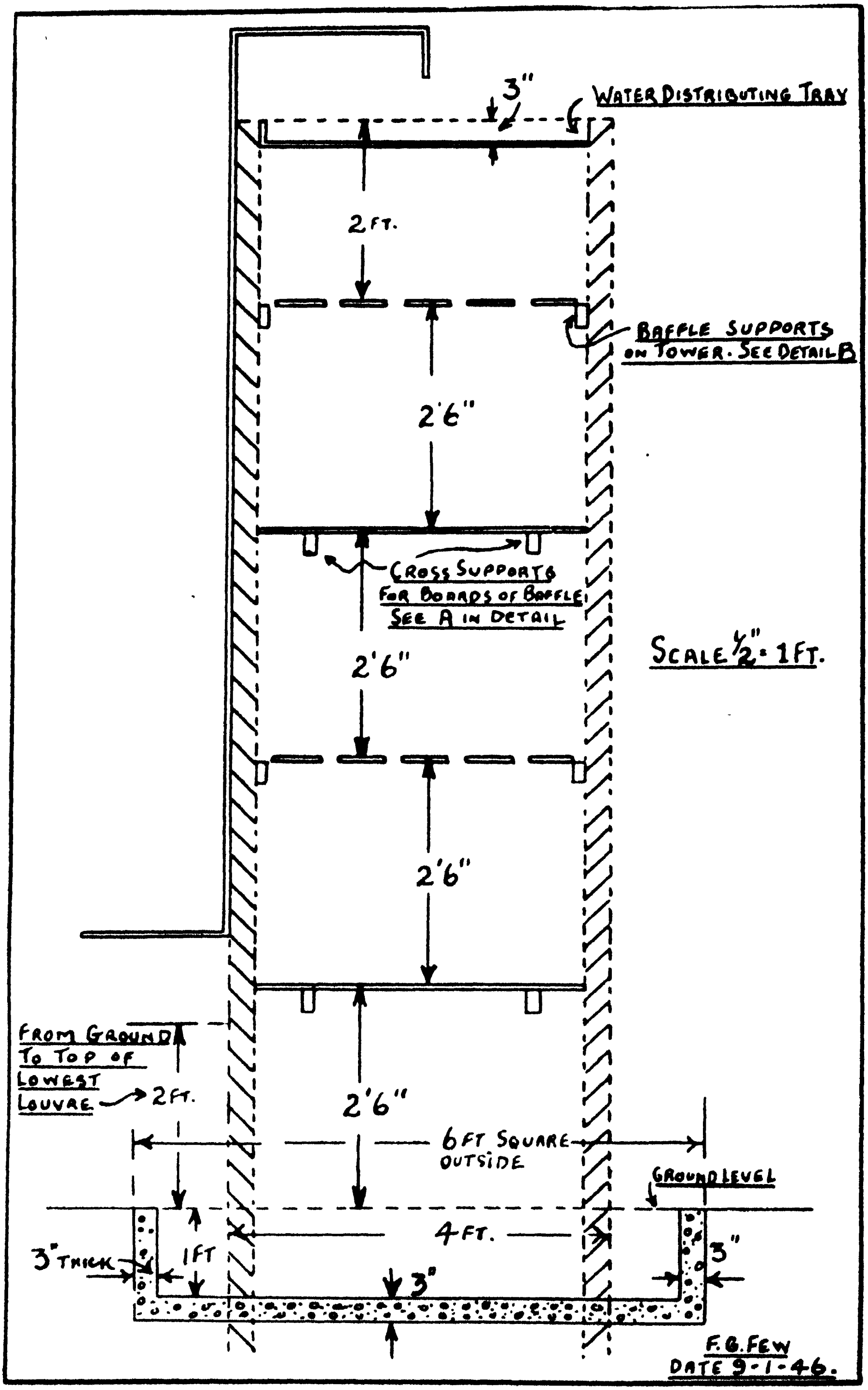


Plate 3.
Sectional elevation showing number and desposition of baffles and concrete pit.

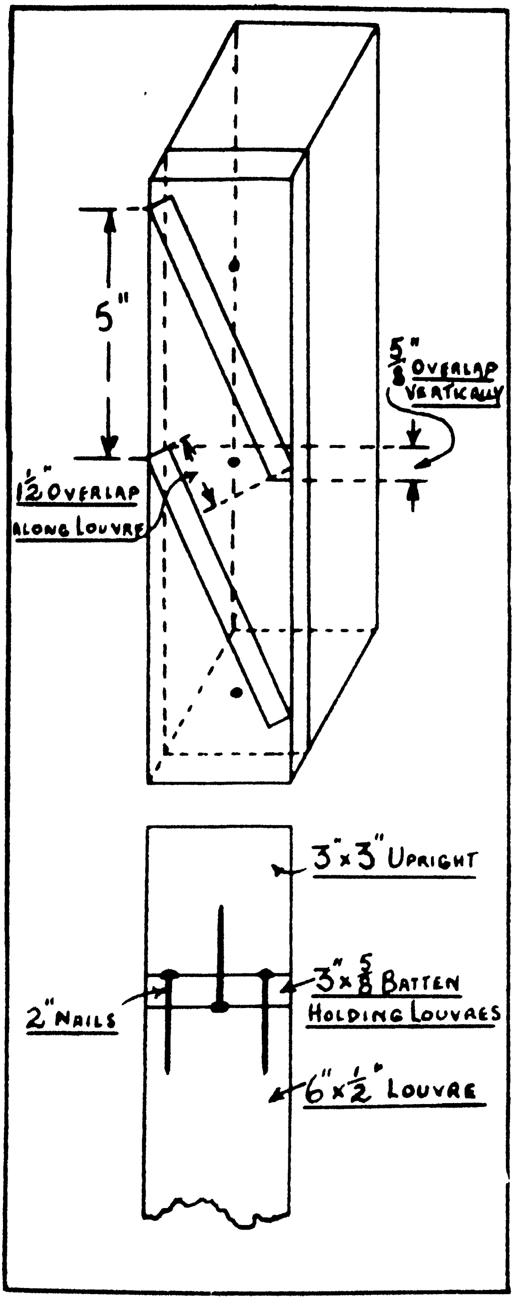


Plate 4

Details showing method of nailing louvres to batten strips and assembled sections to tower uprights.

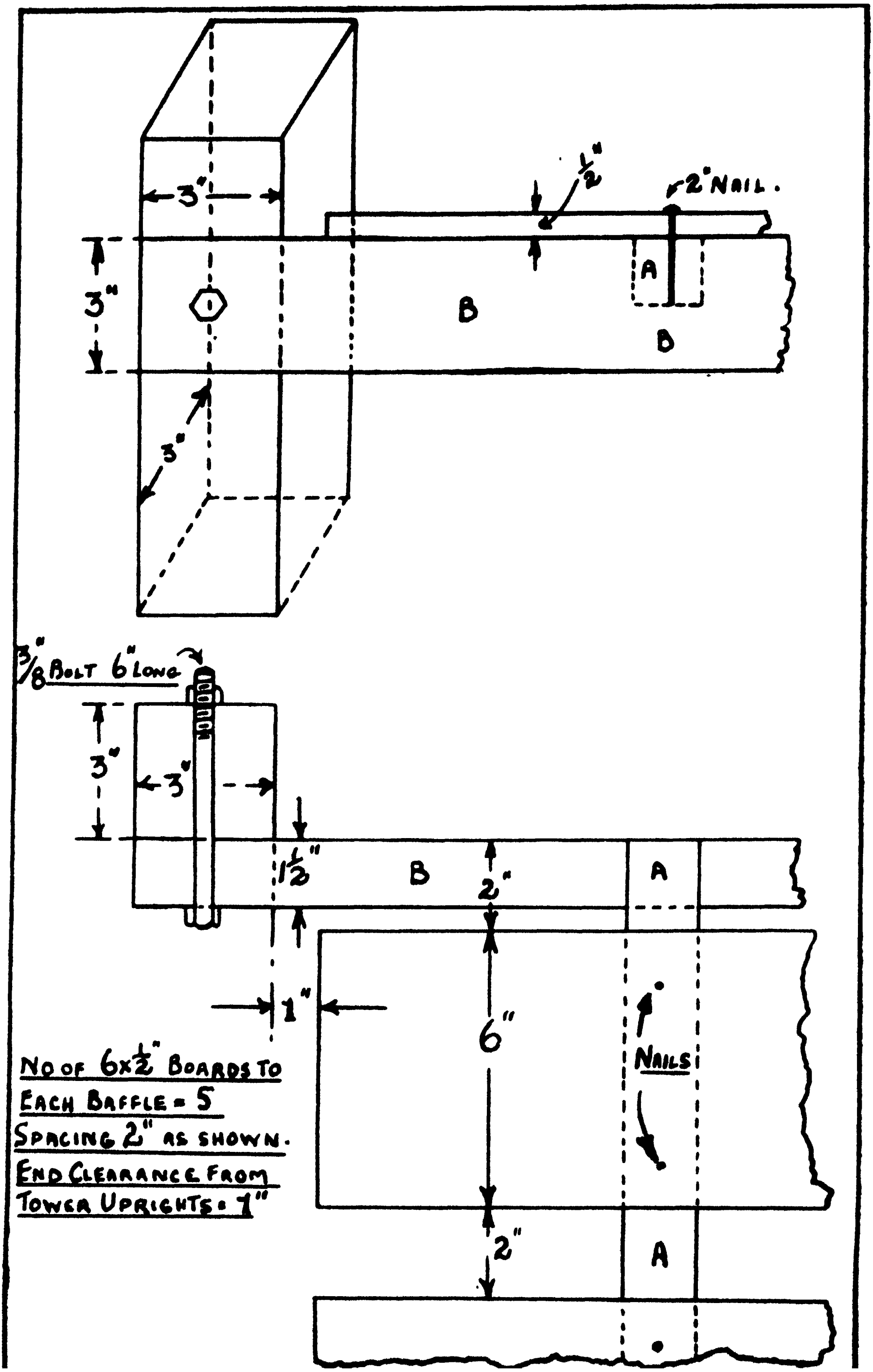


Plate 5.
Showing baffle boards nailed to cross supports A and supports B for completed baffles bolted to tower uprights.

Scale 3in. = 1ft. —F. G. Few, 9/1/46.

SUMMARY OF MATERIALS REQUIRED.

Timber—

3in. by 3in. hardwood—four lengths of 15ft. each.

6in. by ½in. hardwood—100 lengths of 3ft. 4¾in. each; 20 lengths of 3ft. 4in. each.

3in. by 1½in. hardwood—8 lengths of 3ft. 6in. each; 8 lengths of 4ft. each.

3in. by ⅝in. hardwood—8 lengths of 10ft. each; 8 lengths of 7ft. each.

Concrete: Materials for approximately 20 cubic feet, allowing for concreting in of tower uprights. This requires about two-thirds of a yard of sand-gravel mixture and four bags of cement.

Piping: Threequarter-inch galvanised of a length determined by position of tower relative to dairy building. Clips to hold piping to tower also required.

Bolts and nails: Sixteen bolts each ⅜in. by 6in. long. Nails: Supply of 2in.

Water Distributing Tray: Plain galvanised iron sheet 3ft. 6in. square with 3in. sides soldered.

Circulating Pump: Three-quarter-inch centrifugal pump, belt-driven from shaft in dairy.

Cooler: Standard tubular cooler either for milk or cream, as the case may be.

CONSTRUCTION OF TOWER.

The four tower uprights are erected on the chosen site after first excavating the necessary pit below the ground level. The posts are concreted in the ground up to the level of the bottom concrete of the pit—i.e., up to 1ft. 3in. from the ground level. The baffles and distributing tray are assembled and placed in position as shown on the drawings. Sections of battening from the 10ft. lengths are cut to fit between the supports (B) bolted to the uprights and the appropriate number of louvres are fixed to the battens by nailing through from the outside of the battens into the louvres themselves. The assembled sections are then nailed to the tower uprights, the nails passing through the battens in the reverse direction to those holding the louvres. The tower bracing is then finally secured, and the piping, etc., arranged as required. Construction of the concrete pit is carried out, and any light iron or steel reinforcements available can be advantageously added when laying down. Similarly, a concrete path strip 2ft. wide all round the tower prevents mud, etc., from easily entering the pit during wet weather or following excessive drift loss from the tower due to high winds. The path should slope away from the tower across its width to prevent water entering the pit during wet weather."

The approximate costs in Western Australia of the materials required are as under.

	£	s.	d.
Timber	10	0	0
Cement	1	3	0
Bolts and Nails		7	4
Three-quarter-inch Pump .. .	5	5	0
Three-quarter-inch Piping (say 50ft.) ..	1	7	0
	18	2	4

During the period of the year April to October the dry bulb temperatures (Perth 1946) average for 9 p.m. was 57.5°F., and midnight 56.4°F. Therefore in these months once the evening milk has been cooled, allowing it to stand at atmospheric temperature will achieve as good results as would be possible by any attempt at further natural cooling with water. This, however, does not apply during the rest of the year (November to March) when the averages for 9 p.m. and midnight were 67.0 and 65°F. respectively, with the highest recording for 9 p.m. being 92.1°F. and midnight 86.8°F.

It will be readily realised that if cooled milk is allowed to stand in the atmosphere at these temperatures, the beneficial effect of the original cooling will be largely nullified.

The problem now becomes. "How can the evening milk be kept cool?"

By means of a ball cock in the waterline from the main supply to the pit, and a by pass in the delivery line to the tower, the cooled water in the pit can be diverted to a trough sufficiently deep to allow the cans to be submerged to the level of the milk. This should be done after allowing the water to circulate over the tower for some time after the last of the milk has been run over the cooler, at least during the time taken in cleansing the milking machine and other utensils.

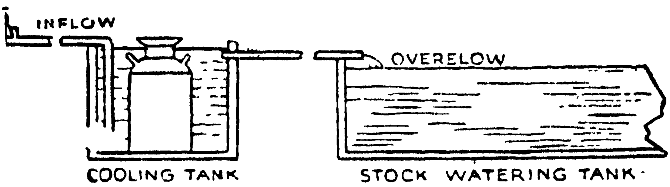


Fig 6

It is an economical advantage if the trough is elevated sufficiently to enable the overflow to run to a stock watering tank as illustrated in figure 6.

Even if the water from the well is sufficiently cool to pump directly through the milk cooler, the trough for holding the cans will be used with advantage when filled with fresh water direct from the well after milking is completed.

The lids should be placed loosely on the cans.

Good results can be obtained without the use of a surface cooler, by placing the cans in the cooling trough as soon as they are filled. The trough is filled with cooled water, and the milk and water stirred, using separate stirrers for each, at intervals to ensure uniform cooling. Alternatively, the full cans with lids attached may be rocked in the water. This agitates both the milk and water and obviates contaminating the milk by means of the stirrer. The water in the trough should be changed regularly as its temperature rises. The cooling rate is slower by this method and it is only suitable where unlimited quantities of water are available.

If the cooling has been done with a surface cooler, stirring the milk in the can will not further reduce the temperature unless the night air is cold.

The most efficient milk cooler for farm use is the tubular surface type. These are available in capacities varying from 40-80 gallons of milk per hour at prices ranging from £7 to £15.

Providing the maximum water flow is maintained through the cooler and the milk flow capacity is not exceeded, the milk temperature can be reduced to within 2°F. of the water temperature. It is necessary that the cooler be set to hang perpendicularly so that the milk flow is distributed evenly over the cooling surface.

Some farmers are of the opinion that because the morning milk is delivered to the factory early, that cooling is unnecessary. This is bad practice, and it is important that the morning milk be cooled as soon as it is produced. It should be remembered that the first of this milk may be drawn as early as 5 a.m. and may not reach the factory till 9 a.m. or later. At temperatures of 90°F. and over the undesirable bacterial activity possible during this period is considerable, and even though the milk is accepted at the factory, the deterioration in quality will have a far reaching effect on the finished product.

The full cans should be protected from the rays of the sun at the pick up point and during transit.

The cooling of milk, as outlined in the foregoing will result in a definite improvement in quality. It is necessary, however, for producers to continue to take particular care in the cleansing and sterilisation of all utensils with which the milk comes in contact.

In this respect it should be realised that the tubular cooler is an additional piece of equipment not particularly easy to clean and sterilise, and if neglected may reduce the quality of the milk by increasing the rate of contamination.

RESPONSES OF OATS TO ZINC, PHOSPHATE AND COPPER ON NEWLY CLEARED LIGHT LAND IN WESTERN AUSTRALIA.

By T. C. DUNNE, S. T. SMITH and H. G. CARISS.

Irrespective of whether the immediate aim of the clearing of light land in the wheat and sheep areas is the establishment of pasture or the production of cereals, it is reasonable to assume that the ultimate maintenance of productivity will depend on the alternation of pasture, preferably with a legume base, with cereal crops.

Past experience in many districts has shown that, with normal cultivation and manuring, large areas do not become sufficiently productive of either pasture or cereals until some years after the initial clearing and cultivation. For obvious reasons, this delay in receiving adequate returns has seriously hindered the development of many areas in satisfactory rainfall zones.

Cultivation is usually the first operation in the opening of such areas and subsequently a satisfactory stubble burn is of considerable value for the economic control of regrowth. At the same time, a reasonable cereal grain yield is needed in these early stages if development is to be financed.

The poor crop yields and sparse stubbles obtained on many light soils prompted the investigations reported hereunder. These experiments represent only an attempt to improve by fertiliser treatment the growth and yield of oats on newly cleared light land.

For the purpose of the experiments farmers in widely separated portions of the State offered the use of newly cleared light land which had been fallowed the previous year. The trials were sown and harvested by individual farmers with the help and supervision of departmental officers. Experimental areas were selected at Lake Grace, South Borden, Moora and Kojonup.

Brief descriptions of the sites are as follows:—

Lake Grace—property of D. L. Elliott.

This site is typical of a large area carrying broombush with scattered mallee and acacias. The soil is a brownish yellow sandy loam to loam containing small gravel and overlying massive laterite at depths varying from a few inches to a little over a foot. The soil is fine and powdery when dry but easily worked when wet. It is slightly acid (about pH 5.5)

South Borden—property of J. Campbell.

The area in general is one of sparsely vegetated scrub plain with scattered mallee seldom exceeding 8 ft. in height. The soil of the experiment site was a grey loamy sand with varying amounts of lateritic gravel. At depths varying from 8 to 18 inches the sandy and gravelly surface is underlain by a yellowish brown friable clay. The surface soil was about pH 6.

Moora—property of M. L. Isbister.

The scrub plain of this area consists mainly of fairly deep sandy soil on the slopes and in the depressions with gravel and laterite outcrops on the ridges. On the sloping land of the experiment, the surface was a grey sand which changed with depth to a yellow grey fine sand with ferruginous gravel. This layer extended downward for some feet. The soil is slightly acid (about pH 6).

Kojonup—property of R. E. Cussons.

This experimental site was on land which had previously carried Wandoo (*E. redunca*). The soil consists of a dark grey gravelly sand to a depth of a foot or more below which a yellow tough clay is usually encountered. On this particular site the gravel was quite dense in the surface soil which is slightly acid (about pH 6).

FERTILISER TREATMENTS.

Similar fertiliser treatments were used for the experiments at Lake Grace, South Borden and Barberton where randomised layouts of six treatments replicated five times (30 plots) were used. At Kojonup, the layout consisted of five treatments replicated five times. The fertiliser mixtures used were—

Lake Grace, South Borden, Moora.

Treatment A—Superphosphate 112 lb/ac.

Treatment B—Superphosphate 112 lb/ac. plus crude zinc oxide (Zn) 5 lb./ac.

Treatment C—Superphosphate 112 lb/ac. plus copper ore (Cu) 8 lb/ac.

Treatment D—Superphosphate 112 lb/ac. plus crude zinc oxide 5 lb/ac., copper ore 8 lb./ac., manganese sulphate (Mn) 10 lb./ac., sodium molybdate (Mo) ½ lb/ac.

Treatment E—Superphosphate 224 lb/ac.

Treatment F—Superphosphate 224 lb/ac. plus crude zinc oxide, copper ore.

The crude zinc oxide used contained 50-60% zinc and the copper ore contained about 15% copper.

Kojonup.

Treatment A—Superphosphate 112 lb/ac.

Treatment B—Superphosphate 112 lb/ac. plus zinc sulphate 5 lb/ac.

Treatment C—Superphosphate 112 lb/ac. plus Zinc sulphate 5lb/ac plus copper ore 8 lb/ac.

Treatment D—Superphosphate 112 lb/ac. plus zinc sulphate 5 lb/ac. plus copper ore 8 lb/ac. plus sodium molybdate ½ lb/ac.

Treatment E—Superphosphate 224 lb/ac. plus zinc sulphate 5 lb/ac. plus copper ore 8 lb/ac.

SEEDING.

The seeding was carried out as follows:—

Lake Grace—Oats var. Guyra—40 lb/ac.—June 3, 1948.

South Borden—Oats var. Dale—40 lb/ac.—May 25, 1948.

Barberton—Oats var. Ballidu—40 lb/ac.—May 10, 1948.

Kojonup—Oats var. Fulghum—40 lbs/ac.—May 20, 1948.

Due to the lateness of the opening rains, seeding at the South-eastern centres was later than anticipated.

OBSERVATION OF GROWTH.

The first survey of the experiment was made during August when the best grown plants were about 9in. in height. At that stage, the effect of zinc in promoting healthy growth was quite obvious.

Plants without zinc had developed, on the leaves, a bronze tipping which progressively darkened and extended downward until the outer leaves were completely dark grey to black in colour when they died. Newly emerging leaves developed similar bronze tipping, and it was later noted that these in turn darkened and died. Growth was naturally stunted.

By contrast, the plants to which zinc had been supplied appeared quite healthy. Nevertheless, the plants supplied with 2 cwt. of superphosphate with zinc and copper had made most growth, indicating a stimulus from the higher rate of superphosphate.

In September, the differences between plants supplied with zinc and those receiving only superphosphate was more striking. The latter plants were still stunted and dark in colour whereas the zinc treated plants had made excellent growth. Nevertheless, all plants supplied with the lower rate of superphosphate (1 cwt.) had partially folded leaves which were not apparent on the plants of the 2 cwt. of superphosphate plus zinc and copper plots. Copper fertilisers had not obviously improved growth.

During October, the no-zinc plots began to show recovery and in some instances made rapid growth. Much better crops than might have been expected earlier in the season eventuated at some sites, but in no case did these plots appear to be nearly as good as those supplied with zinc fertiliser.

The oat plants not supplied with zinc matured two to three weeks later than the remainder. At maturity the lower leaves of the no-zinc plants dried a dull grey to greyish black colour, and the straw usually had a greyish tinge. Even where reasonable recovery had been made in spring, the straw never developed brightness and it was still sparse and spindly. The oat grain was greyish, brownish or flecked.

Illustration 1, below, compares plants with and without zinc. Another photograph (Illustration 2.) shows the straw cut after harvesting in plots with and without zinc.

Illustration 1.
Mature plants from plots at Lake Grace.
Plants on left—no zinc.
Plants on right—supplied with zinc oxide.

Illustration 2
Bundles of straw collected from three square yards after harvesting plots at Lake Grace
On left zinc oxide supplied On right no zinc

GRAIN YIELDS.

Lake Grace and South Borden

The harvesting data for the above centres are given below (Table 1).

TABLE 1.

Treatment.	Lake Grace Guyra Oats Bush. per Acre	South Borden Dale Oats Bush. per Acre.
Super 112	5·9	11·1
Super 112, Zn	21·2	19·9
Super 112, Zn, Cu .	22·6	21·4
Super 112, Zn, Cu, Mn, Mo	21·4	21·5
Super 224	8·4	16·8
Super 224, Zn, Cu	22·4*	25·6
Difference for Significance 1% level	3·2	2·4
5% level	2·3	1·8

* Due to earliest maturity and inclement weather, grain estimated to be at least 10% of the crop shed before harvesting.

The data show clearly the increased grain yield associated with the use of zinc fertiliser. The use of 2 cwt. of superphosphate gives a significantly increased yield as compared with 1 cwt. per acre where no zinc is used. In addition, at South Borden and probably at Lake Grace the plots with zinc and copper produced more grain with 2 cwt. of superphosphate per acre than with 1 cwt. per acre.

Moora.

Unfortunately the yield figures obtained at Moora could not be accepted as being reliable. By the time the no-zinc plots had matured, considerable shedding of grain had occurred on the earlier matured other plots. It should be noted, however, that the plants manured only with superphosphate yielded at the rate of about 15 bushels of oats per acre showing that under certain conditions fair yields can be obtained from plants which were far from promising in the earlier growth stages.

Kojonup

As mentioned above, fewer fertiliser treatments were used at this centre and the yields are shown separately below. (Table 2)

TABLE 2.

Treatments	Kojonup Fulghum oats bush. per acre
Super 112	10.6
Super 112, Zn	16.4
Super 112, Zn, Cu	19.2
Super 112, Zn, Cu, Mo	13.1
Super 224 Zn, Cu	18.0
Difference for significance	
1% level	2.1
5% level	1.5

The figures from Kojonup demonstrate again the benefit to be derived from the use of zinc fertiliser. A further increase in yield was obtained by using copper fertiliser in addition to zinc but extra superphosphate did not improve yields. Molybdenum had the effect of depressing yields.

CONCLUSIONS AND RECOMMENDATIONS.

In view of the fact that the experiments reported above were conducted at widely separated centres, it is reasonable to conclude that manuring only with superphosphate will not produce the best growth or grain yield of oats on newly cleared light land. It is also almost certain that the addition of a zinc compound as a fertiliser will bring about greatly improved yields of oats on such country.

It is therefore recommended, that, where oats are to be grown under these conditions, a zinc compound be used in addition to superphosphate. For this purpose, it is suggested that, until further information is available, zinc oxide be used at the rate of about 3lb. per acre. Zinc sulphate can be used as an alternative but to supply equivalent zinc about 8lb. per acre of this material would be necessary.

Light land which has been cleared for some time may not give similar responses to zinc. Although no experimental data are available, observations in various areas suggest that the abnormal symptoms described above are most severe with the first crop and lessen thereafter even though no zinc has been purposely applied. It seems unlikely that the small amount of zinc normally in superphosphate would altogether account for the improvement noted. Further information should be obtained during the coming season.

It is important to remember that the responses to zinc reported above have been obtained with oats. Wheat, grown under similar conditions, did not show any comparable symptoms nor was its growth badly stunted. Experiments have shown some increased yields where zinc was used with wheat but they were of much less magnitude than those obtained with oats. On the other hand, Wimmera ryegrass without zinc, did show symptoms comparable with those of oats and excellent growth reponses were obtained where this element was used.

It was noted that, in addition to zinc fertilisers, extra superphosphate further increased yields and that the use of higher rates would probably be profitable. In any case, the figures suggest that, for first crops, applications of less than 1 cwt. per acre would be unwise.

The Kojonup experiment, though on light soil, was on land previously carrying Wandoo and can be considered separately from the other areas. Not only did zinc fertiliser give a substantial increase in yield but a further improvement resulted from the use of copper. In a preliminary trial conducted in 1947 many copper deficient plants were found where this element was not supplied. It is therefore recommended that for a cereal crop immediately following clearing of such country, both zinc and copper be used in addition to superphosphate Either copper sulphate at the rate of 5lb. per acre or copper ore (10 per cent. Cu) at the rate of 12½lb. per acre would be satisfactory.

In spite of the effect of zinc on oats on these light lands, and in spite of the fact that both zinc oxide and zinc sulphate were effective, it is not necessarily certain that the symptoms noted on the superphosphate plots were due to a true zinc deficiency. Both Millikan (1938) in Victoria and Riceman (1945) in South Australia have reported responses to zinc but the symptoms noted in this State were not observed by them. When Piper (1940) grew oats under scientifically controlled conditions, zinc deficient plants developed symptoms quite different from those reported in this paper These facts, however, do not affect the conclusions reached or the recommendation made for the use of zinc on our new light soils.

SUMMARY.

An account is given of fertiliser experiments with oats conducted on newly cleared light land at Lake Grace, South Borden, Moora and Kojonup.

Excellent responses in vegetative growth and in grain yields were obtained from the use of zinc fertilisers. The symptoms, which consist of bronzing and darkening of the lower leaves with stunted growth, which were developed by plants in the absence of zinc are described.

In addition to zinc, further growth and yield improvement followed the use of a higher rate of superphosphate at some centres and the use of copper fertiliser at Kojonup.

Recommendation is made that zinc fertiliser be used with not less than 1 cwt. per acre of superphosphate on all newly cleared light land being sown to oats. In addition the use of copper is recommended for the type of soil used in the Kojonup experiment.

ACKNOWLEDGMENT.

In addition to the assistance received from the farmers mentioned in this paper, acknowledgment is made of the co-operation of the Road Boards at Lake Grace, Gnowangerup and Moora.

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BUTTER-FAT READY RECKONER

(20-100 lbs.: 30-50 per cent. test.)

Test.	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
lbs. 20	6·0	6·2	6·4	6·6	6·8	7·0	7·2	7·4	7·6	7·8	8·0	8·2	8·4	8·6	8·8	9·0	9·2	9·4	9·6	9·8	10·0
21	6·3	6·5	6·7	6·9	7·1	7·4	7·6	7·8	8·0	8·2	8·4	8·6	8·8	9·0	9·2	9·5	9·7	9·9	10·1	10·3	10·5
22	6·6	6·8	7·0	7·3	7·5	7·7	7·9	8·1	8·4	8·6	8·8	9·0	9·2	9·5	9·7	9·9	10·1	10·3	10·6	10·8	11·0
23	6·9	7·1	7·4	7·6	7·8	8·1	8·3	8·5	8·7	9·0	9·2	9·4	9·7	9·9	10·1	10·4	10·6	10·8	11·0	11·3	11·5
24	7·2	7·4	7·7	7·9	8·2	8·4	8·6	8·9	9·1	9·4	9·6	9·8	10·1	10·3	10·6	10·8	11·0	11·3	11·5	11·8	12·0
25	7·5	7·8	8·0	8·3	8·5	8·8	9·0	9·3	9·5	9·8	10·0	10·3	10·5	10·8	11·0	11·3	11·5	11·8	12·0	12·2	12·5
26	7·8	8·1	8·3	8·6	8·8	9·1	9·4	9·6	9·9	10·1	10·4	10·7	10·9	11·2	11·4	11·7	12·0	12·2	12·5	12·7	13·0
27	8·1	8·4	8·6	8·9	9·2	9·5	9·7	10·0	10·3	10·5	10·8	11·1	11·3	11·6	11·9	12·2	12·4	12·7	13·0	13·2	13·5
28	8·4	8·7	9·0	9·2	9·5	9·8	10·1	10·4	10·6	10·9	11·2	11·5	11·8	12·0	12·3	12·6	12·9	13·2	13·4	13·7	14·0
29	8·7	9·0	9·3	9·6	9·9	10·2	10·4	10·7	11·0	11·3	11·6	11·9	12·2	12·5	12·8	13·1	13·3	13·6	13·9	14·2	14·5
30	9·0	9·3	9·6	9·9	10·2	10·5	10·8	11·1	11·4	11·7	12·0	12·3	12·6	12·9	13·2	13·5	13·8	14·1	14·4	14·7	15·0
31	9·3	9·6	9·9	10·2	10·5	10·9	11·2	11·5	11·8	12·1	12·4	12·7	13·0	13·3	13·6	14·0	14·3	14·6	14·9	15·2	15·5
32	9·6	9·9	10·2	10·6	10·9	11·2	11·5	11·8	12·2	12·5	12·8	13·1	13·4	13·8	14·1	14·4	14·7	15·0	15·4	15·7	16·0
33	9·9	10·2	10·6	10·9	11·2	11·6	11·9	12·2	12·5	12·9	13·2	13·5	13·9	14·2	14·5	14·9	15·2	15·5	15·8	16·2	16·5
34	10·2	10·5	10·9	11·2	11·6	11·9	12·2	12·6	12·9	13·3	13·6	13·9	14·3	14·6	15·0	15·3	15·6	16·0	16·3	16·7	17·0
35	10·5	10·9	11·2	11·6	11·9	12·3	12·6	13·0	13·3	13·7	14·0	14·4	14·7	15·1	15·4	15·8	16·1	16·5	16·8	17·2	17·5
36	10·8	11·2	11·5	11·9	12·2	12·6	13·0	13·3	13·7	14·0	14·4	14·8	15·1	15·5	15·8	16·2	16·6	16·9	17·3	17·6	18·0

BUTTER-FAT READY RECKONER—continued.

Test.	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
lbs. 37	11·1	11·5	11·8	12·2	12·6	13·0	13·3	13·7	14·1	14·4	14·8	15·2	15·5	15·9	16·3	16·7	17·0	17·4	17·8	18·1	18·5
38	11·4	11·8	12·2	12·5	12·9	13·3	13·7	14·1	14·4	14·8	15·2	15·6	16·0	16·3	16·7	17·1	17·5	17·9	18·2	18·6	19·0
39	11·7	12·1	12·5	12·9	13·3	13·7	14·0	14·4	14·8	15·2	15·6	16·0	16·4	16·8	17·2	17·6	17·9	18·3	18·7	19·1	19·5
40	12·0	12·4	12·8	13·2	13·6	14·0	14·4	14·8	15·2	15·6	16·0	16·4	16·8	17·2	17·6	18·0	18·4	18·8	19·2	19·6	20·0
41	12·3	12·7	13·1	13·5	13·9	14·4	14·8	15·2	15·6	16·0	16·4	16·8	17·2	17·6	18·0	18·5	18·9	19·3	19·7	20·1	20·5
42	12·6	13·0	13·4	13·9	14·3	14·7	15·1	15·5	16·0	16·4	16·8	17·2	17·6	18·1	18·5	18·9	19·3	19·7	20·2	20·6	21·0
43	12·9	13·3	13·8	14·2	14·6	15·1	15·5	15·9	16·3	16·8	17·2	17·6	18·1	18·5	18·9	19·4	19·8	20·2	20·6	21·1	21·5
44	13·2	13·6	14·1	14·5	15·0	15·4	15·8	16·3	16·7	17·2	17·6	18·0	18·5	18·9	19·4	19·8	20·2	20·7	21·1	21·6	22·0
45	13·5	14·0	14·4	14·9	15·3	15·8	16·2	16·7	17·1	17·6	18·0	18·5	18·9	19·4	19·8	20·3	20·7	21·2	21·6	22·1	22·5
46	13·8	14·3	14·7	15·2	15·6	16·1	16·6	17·0	17·5	17·9	18·3	18·9	19·3	19·8	20·2	20·7	21·2	21·6	22·1	22·5	23·0
47	14·1	14·6	15·0	15·5	16·0	16·5	16·9	17·4	17·9	18·3	18·7	19·3	19·7	20·2	20·7	21·2	21·6	22·1	22·6	23·0	23·5
48	14·4	14·9	15·4	15·8	16·3	16·8	17·3	17·8	18·2	18·7	19·1	19·7	20·2	20·6	21·1	21·6	22·1	22·6	23·0	23·5	24·0
49	14·7	15·2	15·7	16·2	16·7	17·2	17·6	18·1	18·6	19·1	19·5	20·1	20·6	21·1	21·6	22·1	22·5	23·0	23·5	24·0	24·5
50	15·0	15·5	16·0	16·5	17·0	17·5	18·0	18·5	19·0	19·5	20·0	20·5	21·0	21·5	22 0	22·5	23·0	23·5	24·0	24·5	25·0
51	15·3	15·8	16·3	16·8	17·3	17·9	18·4	18·9	19·4	19·9	20·3	20·9	21·4	21·9	22·4	23·0	23·5	24·0	24·5	25·0	25·5
52	15·6	16·1	16·6	17·2	17·7	18·2	18·7	19·2	19·8	20·3	20·8	21·3	21·8	22·4	22·9	23·4	23·9	24·4	25·0	25·5	26·0
53	15·9	16·4	17·0	17·5	18·0	18·6	19·1	19·6	20·1	20·7	21·2	21·7	22·3	22·8	23·3	23·9	24·4	24·9	25·4	26·0	26·5
54	16·2	16·7	17·3	17·8	18·4	18·9	19·4	20·0	20·5	21·1	21·6	22·1	22·7	23·2	23·8	24·3	24·8	25·4	25·9	26·5	27·0

BUTTER-FAT READY RECKONER—continued.

Test.	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
lbs. 55	16·5	17·1	17·6	18·2	18·7	19·3	19·8	20·4	20·9	21·5	22·0	22·6	23·1	23·7	24·2	24·8	25·3	25·9	26·4	27·0	27·5
56	16·8	17·4	17·9	18·5	19·0	19·6	20·2	20·7	21·3	21·8	22·4	23·0	23·5	24·1	24·6	25·2	25·8	26·3	26·9	27·4	28·0
57	17·1	17·7	18·2	18·8	19·4	20·0	20·5	21·1	21·7	22·2	22·8	23·4	23·9	24·5	25·1	25·7	26·2	26·8	27·4	27·9	28·5
58	17·4	18·0	18·6	19·1	19·7	20·3	20·9	21·5	22·0	22·6	23·2	23·8	24·4	24·9	25·5	26·1	26·7	27·3	27·8	28·4	29·0
59	17·7	18·3	18·9	19·5	20·1	20·7	21·2	21·8	22·4	23·0	23·6	24·2	24·8	25·4	26·0	26·6	27·1	27·7	28·3	28·9	29·5
60	18·0	18·6	19·2	19·8	20·4	21·0	21·6	22·2	22·8	23·4	24·0	24·6	25·2	25·8	26·4	27·0	27·6	28·2	28·8	29·4	30·0
61	18·3	18·9	19·5	20·1	20·7	21·4	22·0	22·6	23·2	23·8	24·4	25·0	25·6	26·2	26·8	27·5	28·1	28·7	29·3	29·9	30·5
62	18·6	19·2	19·8	20·5	21·1	21·7	22·3	22·9	23·6	24·2	24·8	25·4	26·0	26·7	27·3	27·9	28·5	29·1	29·8	30·4	31·0
63	18·9	19·5	20·2	20·8	21·4	22·1	22·7	23·3	23·9	24·6	25·2	25·8	26·5	27·1	27·7	28·4	29·0	29·6	30·2	30·9	31·5
64	19·2	19·8	20·5	21·1	21·8	22·4	23·0	23·7	24·3	25·0	25·6	26·2	26·9	27·5	28·2	28·8	29·4	30·1	30·7	31·4	32·0
65	19·5	20·2	20·8	21·5	22·1	22·8	23·4	24·1	24·7	25·4	26·0	26·7	27·3	28·0	28·6	29·3	29·9	30·6	31·2	31·9	32·5
66	19·8	20·5	21·1	21·8	22·4	23·1	23·8	24·4	25·1	25·7	26·4	27·1	27·7	28·4	29·0	29·7	30·4	31·0	31·7	32·3	33·0
67	20·1	20·8	21·4	22·1	22·8	23·5	24·1	24·8	25·5	26·1	26·8	27·5	28·1	28·8	29·5	30·2	30·8	31·5	32·2	32·8	33·5
68	20·4	21·1	21·8	22·4	23·1	23·8	24·5	25·2	25·8	26·5	27·2	27·9	28·6	29·2	29·9	30·6	31·3	32·0	32·6	33·3	34·0
69	20·7	21·4	22·1	22·8	23·5	24·2	24·8	27·0	26·2	26·9	27·6	28·3	29·0	29·7	30·4	31·1	31·7	32·4	33·1	33·8	34·5
70	21·0	21·7	22·4	23·1	23·8	24·5	25·2	27·4	26·6	27·3	28·0	28·7	29·4	30·1	30·8	31·5	32·2	32·9	33·6	34·3	35·0
71	21·3	22·0	22·7	23·4	24·1	24·9	25·6	26·3	27·0	27·7	28·4	29·1	29·8	30·5	31·2	32·0	32·7	33·4	34·1	34·8	35·5
72	21·6	22·3	23·0	23·8	24·5	25·2	25·9	28·1	27·4	28·1	28·8	29·5	30·2	31·0	31·7	32·4	33·1	33·8	34·6	35·3	36·0

BUTTER-FAT READY RECKONER—continued.

Test.	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
lbs. 73	21·9	22·6	23·4	24·1	24·8	25·6	26·3	28·4	27·7	28·5	29·2	29·9	30·7	31·4	32·1	32·9	33·6	34·3	35·0	35·8	36·5
74	22·2	22·9	23·7	24·4	25·2	25·9	26·6	28·8	28·1	28·9	29·6	30·3	31·1	31·8	32·6	33·3	34·0	34·8	35·5	36·3	37·0
75	22·5	23·3	24·0	24·8	25·5	26·3	27·0	27·8	28·5	29·3	30·0	30·8	31·5	32·3	33·0	33·8	34·5	35·3	36·0	36·8	37·5
76	22·8	23·6	24·3	25·1	25·8	26·6	27·4	28·1	28·9	29·6	30·4	31·2	31·9	32·7	33·4	34·2	35·0	35·7	36·5	37·2	38·0
77	23·1	23·9	24·6	25·4	26·2	27·0	27·7	28·5	29·3	30·0	30·8	31·6	32·3	33·1	33·9	34·7	35·4	36·2	37·0	37·7	38·5
78	23·4	24·2	25·0	25·7	26·5	27·3	28·1	28·9	29·6	30·4	31·2	32·0	32·8	33·5	34·3	35·1	35·9	36·7	37·4	38·2	39·0
79	23·7	24·5	25·3	26·1	26·9	27·7	28·4	29·2	30·0	30·8	31·6	32·4	33·2	34·0	34·8	35·6	36·3	37·1	37·9	38·7	39·5
80	30·0	24·8	25·6	26·4	27·2	28·0	28·8	29·6	30·4	31·2	32·0	32·8	33·6	34·4	35·2	36·0	36·8	37·6	38·4	39·2	40·0
81	24·3	25·1	25·9	26·7	27·5	28·4	29·2	30·0	30·8	31·6	32·4	33·2	34·0	34·8	35·6	36·5	37·3	38·1	38·9	39·7	40·5
82	24·6	25·4	26·2	27·1	27·9	28·7	29·5	30·3	31·2	32·0	32·8	33·6	34·4	35·3	36·1	36·9	37·7	38·5	39·4	40·2	41·0
83	24·9	25·7	26·6	27·4	28·2	29·1	29·9	30·7	31·5	32·4	33·2	34·0	34·9	35·7	36·5	37·4	38·2	39·0	39·8	40·7	41·5
84	25·2	26·0	26·9	27·7	28·6	29·4	30·2	31·1	31·9	32·8	33·6	34·4	35·3	36·1	37·0	37·8	38·6	39·5	40·3	41·2	42·0
85	25·5	26·4	27·2	28·1	28·9	29·8	30·6	31·5	32·3	33·2	34·0	34·9	35·7	36·6	37·4	38·3	39·1	40·0	40·8	41·7	42·5
86	25·8	26·7	27·5	28·4	29·2	30·1	31·0	31·8	32·7	33·5	34·4	35·3	36·1	37·0	37·8	38·7	39·6	40·4	41·3	42·1	43·0
87	26·1	27·0	27·8	28·7	29·6	30·5	31·3	32·2	33·1	33·9	34·8	35·7	36·5	37·4	38·3	39·2	40·0	40·9	41·8	42·6	43·5
88	26·4	27·3	28·2	29·0	29·9	30·8	31·7	32·6	33·4	34·3	35·2	36·1	37·0	37·8	38·7	39·6	40·5	41·4	42·2	43·1	44·0
89	26·7	27·6	28·5	29·4	30·3	31·2	32·0	32·9	33·8	34·7	35·6	36·5	37·4	38·3	39·2	40·1	40·9	41·8	42·7	43·6	44·5
90	27·0	27·9	28·8	29·7	30·6	31·5	32·4	33·3	34·2	35·1	36·0	36·9	37·8	38·7	39·6	40·5	41·4	42·3	43·2	44·1	45·0

BUTTER-FAT READY RECKONER—continued.

Test	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
lbs. 91	27·3	28·2	29·1	30·0	30·9	31·9	32·8	33·7	34·6	35·5	36·4	37·3	38·2	39·1	40·0	41·0	41·9	42·8	43·7	44·6	45·5
92	27·6	28·5	29·4	30·4	31·3	32·2	33·1	34·0	35·0	35·9	36·8	37·7	38·6	39·6	40·5	41·4	42·3	43·2	44·2	45·1	46·0
93	27·9	28·8	29·8	30·7	31·6	32·6	33·5	34·4	35·3	36·3	37·2	38·1	39·1	40·0	40·9	41·9	42·8	43·7	44·6	45·6	46·5
94	28·2	29·1	30·1	31·0	32·0	32·9	33·8	34·8	35·7	36·7	37·6	38·5	39·5	40·4	41·4	42·3	43·2	44·2	45·1	46·1	47·0
95	28·5	29·5	30·4	31·4	32·3	33·3	34·2	35·2	36·1	37·1	38·0	39·0	39·9	40·9	41·8	42·8	43·7	44·7	45·6	46·6	47·5
96	28·8	29·8	30·7	31·7	32·6	33·6	34·6	35·5	36·5	37·4	38·4	39·4	40·3	41·3	42·2	43·2	44·2	45·1	46·1	47·0	48·0
97	29·1	30·1	31·0	32·0	33·0	34·0	34·9	35·9	36·9	37·8	38·8	39·8	40·7	41·7	42·7	43·7	44·6	45·6	46·6	47·5	48·5
98	29·4	30·4	31·4	32·3	33·3	34·3	35·3	36·3	37·2	38·2	39·2	40·2	41·2	42·1	43·1	44·1	45·1	46·1	47·0	48·0	49·0
99	29·7	30·7	31·7	32·7	33·7	34·7	35·6	36·6	37·6	38·6	39·6	40·6	41·6	42·6	43·6	44·6	45·5	46·5	47·5	48·5	49·5
100	30·0	31·0	32·0	33·0	34·0	35·0	36·0	37·0	38·0	39·0	40·0	41·0	42·0	43·0	44·0	45·0	46·0	47·0	48·0	49·0	50·0

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ARTIFICIAL INSEMINATION AND ITS POSSIBILITIES FOR HERD IMPROVEMENT IN WESTERN AUSTRALIA

M. CULLITY, Superintendent of Dairying. *

ARTIFICIAL insemination is not something new. There are records of mares being inseminated by the Arabs in this way five or six hundred years ago. It has become of wide interest only in the current century and particularly in the last decade. It was the work of Professor Eli Ivanov, a Russian Scientist in showing that sperm could be preserved at low temperatures that gave an impetus to the practice. When scientific methods of obtaining and storing semen were developed, the possibilities of artificial insemination in obviating the keeping of a bull and as a means of herd improvement became widely appreciated.

Artificial insemination is not a very good term, as it suggests something that is divorced from nature. It is, of course, merely a method of directing nature to obtain results which nature unassisted could give. It has been suggested that a better term would be "selective breeding," as it is a method by which the widest use of selected males may be achieved.

The credit for focussing attention on its possibilities must be given to Russian Scientists who began using it on a commercial scale with mares about 1910. They trained inseminators to practise in the field. It was reported that 3,400 mares were treated in 1912 and that a 41% foaling was achieved. Little further work was done during World War I, and it was not until the early 1920's that it was again seriously revived.

By 1928 it was reported that 70,000 mares were being handled.

Work with cattle was commenced about this time. In 1930 nearly 20,000 cows had been inseminated. In 1931 the number had risen to 183,000 and in 1932 to 385,000. Very rapid expansion continued, and in 1937 and 1938, 1,000,000 and 1,500,000 were reported to have been stocked by this method. The latter number represented about five per cent. of all Russian cows.

* Presidential address Society of Dairy Technology, 1948,

Prior to the outbreak of war in 1939, artificial insemination was being used in several European countries, including Denmark, Holland and England.

Demonstrations with its use with mares had been carried out at American Experiment Stations for about 30 years, but it was not until 1938 that the first Association for breeding dairy cattle was commenced. By 1943, there were 99 Associations using 574 bulls breeding to 182,524 cows and in 1945 there were 185 Associations giving this breeding service to 42,020 herds having 342,012 cows.

In Denmark where in 1939 there were 45 Associations inseminating 72,000 cows, the number had risen by 1945 to 96 Associations, using over 600 bulls for more than 400,000 cows.

In England the Ministry of Agriculture in 1942 set up two large scale experimental centres at Reading and Cambridge. Other subsidiary centres have been established and rapid expansion is taking place. In the year ended 31st March, 1947, over 60,000 cows had been inseminated from 69 bulls.

Value in Small Herds.

Why has this practice spread so rapidly ? I have the authority of Dr. John Hammond and others for my belief that it has been the problem of keeping a good bull in a small herd which has stimulated interest in England.

Figures given in a small publication " The Artificial Insemination of Cattle " show that in the counties of Cambridge and Glamorgan the vast proportion of the herds are under 20 cows and most do not include a bull. Thus, in Cambridge, of 2,160 herds, 2,017 had under 20 cows and 1,637 were without a bull. Of the 43 herds over 20 cows, all but eight kept their own bulls. In Glamorgan the position is similar. In the introduction to the booklet, it is pointed out " If all food had to be purchased at present prices, it would cost £50 to keep even a very ordinary bull today, and where the herd consists of 10 cows this would mean £5 per cow got in calf. On small farms even where the produce is home-grown, it will be more economical to have cows artificially inseminated at 25s. per cow, and in place of the bull keep another cow. The profits from keeping another cow will more than pay all the fees for insemination in the herd.

" Quite apart from the cost of keeping a bull, the cost of buying a high class dairy bull today for use in a small herd is prohibitive, and this probably explains why the small farmer does not keep a better bull, and why, in consequence, the general level of our dairy cattle is so poor, for over half our dairy heifers are bred in these small herds."

Thus it would seem that the major incentive to the spread of artificial insemination in England has been the difficulty experienced by owners of small herds—*firstly*, in getting their cows stocked, and, *secondly*, in having them stocked to good bulls. There is reason to believe that this position has been a major reason for its rapid adoption in other countries.

Ward, Director of Herd Improvement, New Zealand, in his report to the New Zealand Dairy Board in 1946—after describing the organisation in the United States—said "While the foregoing is a general description of the type of organisation, it is quite clear that the dominating factor in the expansion of artificial insemination is the reduction in bull costs which it affords the small dairy farmer."

While there are a large number of small herds in West Australia and other parts of Australia and New Zealand, it is most improbable that this factor alone will lead to the organisation of extensive insemination schemes.

The rapid development which has taken place in these countries would not have been possible if the small farmer could not have owned a bull.

Factors Influencing Herd Averages.

Fortunately the Government and stud breeders have appreciated the need for a progressive policy in raising large numbers of bulls from lines of cattle bred for production, for use in the low quality herds originally existing. Consequently there has been a steady improvement in average yields. For example, in this State there has been a rise in average production per cow since 1920 of approximately 150 gallons of milk and 60 lb. of butter fat.

In New Zealand the improvement has been of the same order, but West Australia now only has reached the position where New Zealand was 25 years ago.

There is every reason to believe that by continuing the same policies we should repeat their performance by getting a further increase in yields. It may be expected that we would profit from their experience and progress a little faster.

Some data which has been accumulated in New Zealand is of interest.

A Committee appointed to report on possible further improvement and to submit a Herd Improvement Plan stated—after an examination of average yields over a period of years— " The inescapable conclusion is that the rate of herd improvement has been slowing down rather than accelerating as one would have hoped in view of the rise in herd testing, etc. Improvement in the decade, 1919–1929, was more than twice as rapid as in the period 1929–39, and per cow production is now almost stationary."

They then proceeded to examine the factors which had been responsible for the improvement of 61 lb. of butter fat since 1920, and after a thorough survey of all available data, came to the conclusion that the following factors had concontributed.

	Estimated Share of Improvement.	%
Selection of daughters from highest producing dams	2 lb.	3.3
Elimination of low producers	8 lb.	13.1
Change in Breed Composition	16 lb.	26.2
Improvement in plane of nutrition increase length of lactation, etc.	35 lb.	57.4
	61 lb.	100%

It is surprising that only 10 lb. or 16 per cent. of the improvement achieved in over 20 years was attributed to the selection of the daughters from the best cows and to the elimination of the low producers.

In passing it is of interest to note that 16 lb. or 26.2 per cent. of the improvement was placed to the credit of a breed change. Since 1920, the percentage of Jerseys had increased from 27.5 per cent. to 75 per cent., while Shorthorns had decreased from 58 per cent. to eight per cent. As Jerseys were producing 15 per cent. more butter fat than Shorthorns, the overall improvement can be understood.

By far the greatest factor contributing to the increase in production was improvement in herd management apart from breeding and selection. Better feeding, longer lactations, calving at the best time, together were assessed as being responsible for 57·4 per cent. of the improvement.

The feature that is most significant is the fact that the rate of improvement achieved by the selection of heifers from the best cows was very slow. This is quite easily understood when we examine figures submitted by Ward, based on calving data in the 1940–41 and 1941–42 seasons. He demonstrated that in the average herd a large proportion of heifers from below average cows must be kept to replace normal wastage.

If the herd is being increased in size to meet gradual development of more pastures, as is the case frequently in this State, a greater proportion of below average heifers would be kept.

Thus it must be appreciated that furthur improvement in yields by the selection of daughters of the best cows would be a slow process.

The use of pure bred sires has assisted in speeding up the process in the early stages. The "grading up" of herds by using standard bulls from strains of cows having higher yields than the mates of the sires has been proved effective in lifting yields. It is well-known, however, that this method is best adapted to the improvement of mediocre or scrub herds. As the quality of the herds improve, so the rate of improvement—simply by using bulls of standard type selected on blood lines and ancestral yield data—gradually slows down. Data collected by Ward and others has shown clearly that this is so. An examination of sire surveys made in the herd recording scheme showed that only 23 per cent. of the bulls in New Zealand were improving their progeny ; 22 per cent. were maintaining while 55 per cent. were actually lowering production.

The data has been sorted according to average production of the mates of each bull. Of those mated to cows averaging under 260 lb. butter fat, 51 per cent. were improving, 31 per cent. maintaining, and 18 per cent. reducing production. In the better herds, the position was greatly different. In those yielding over 400 lb. per cow, only five per cent. were improving, 12 per cent. were maintaining, while 83 per cent. were actually lowering averages.

Between these extremes there is a gradual movement. As the average yield of the cows increased, the number of successful bulls decreased, and the number of unsuccessful ones increased.

There is a well recognised phenomenon known as "regression" to breed average. It is a tendency for the progeny of high producing stock to revert towards the average for the breed. If this "regression" did not occur, breeding for production would be relatively easy. One would need only to select sires from high-producing cows and mate them to good cows and to continue gradually building up yields to higher and higher levels. However, all breeders of stud cattle know that this does not occur, except under very careful conditions of selection and breeding, and even then there is a limit beyond which it is increasingly difficult to go.

Thus it is easy to visualise that *a more rapid improvement of yields could be achieved only if those few bulls capable of improving the progeny of high-producing cows could be used over a larger number of cows.* Herein lies the attraction of Artificial Insemination as a means of herd improvement. It is apparent that sires which prove their worth by the performances of their progeny are not easy to locate. Hence when they are found, there must be interest in endeavouring to have them used as widely as possible.

This I suggest is the major justification for considering Artificial Insemination in West Australia. The farms are large enough for the great majority of farmers to hold their own bulls. Hence artificial insemination as a means of eliminating

the farm bulls is unnecessary, but it would be worth while if the few very good bulls—proved by their progeny to be capable of transmitting high productive capacity—could be spread over a large number of cows.

Misconceptions.

There are various misconceptions, however, which should be removed. Reference has been made to the tendency to regress towards breeds average. This can and does occur with bulls used for artificial insemination in exactly the same way as in natural mating. Hence the most important single factor in artificial insemination organisation is the selection of bulls. They must have constitution and breed type, be free of disease, and have been "proved" through their daughters.

If there is one certain way to damn the possibilities inherent in artificial insemination it would be the use of mediocre bulls. It must be emphasised that artificial insemination can do nothing that natural mating will not do, other than to service a greater number of cows. It cannot usher in a millennium, but, if used in an intelligent manner in accordance with the best experience and conclusions, it can be of the greatest value.

It is necessary to emphasise also that even the selection and use of proven bulls will not lead to higher productions, unless management and particularly feeding, is of a satisfactory level. It is notorious that *the most important factor limiting production is the level of nutrition.* We see the effect from season to season due to variation in the condition of our pastures. *Artificial insemination will not overcome the limitations of under-feeding.* Probably the most effective method of lifting our production rapidly would be better feeding of our cows.

Advantages.

There are certain advantages in artificial insemination. It relieves dairy farmers of the obligation of keeping bulls. While it has been suggested that this is an insufficient reason by itself for artificial insemination, there is no doubt that the lifting of this responsibilty would be gladly accepted. Apart from the need for special yards, paddocks and shelters, there is always danger in handling these animals. Their elimination from the farm, therefore, would be welcome. Further, in a properly organised scheme the ordinary farmer would have the opportunity of having his cows inseminated from bulls of higher quality than he could afford to purchase with his own resources.

By not having to keep a bull the farmer can milk at least one extra cow, and over a large number of properties this would result in an appreciable increase in output.

Some disease is spread by bulls, consequently the elimination of their use could mean a reduction in the incidence of certain diseases including those affecting the fertility of the cows. As it is desirable that artificial insemination be under veterinary supervision and for the technicians employed to have some training in the recognition of disorders affecting conception, the loss incurred by farmers could be reduced.

Probably one of the greatest advantages, however, would be the creation of greater interest amongst farmers in better breeding methods. The bulls used would be open to inspection and their pedigrees and records of performances would be made available to all.

Disadvantages.

It is not possible to draw attention to very many disadvantages. There are many difficulties in organising a satisfactory scheme, but from the farmer's point

of view it may be suggested the only real disability is that he is obliged to communicate with the Centre whenever his cows are in season and he has to arrange for the cows to be available for attention on the arrival of the technician.

While I have proceeded on the assumption that the "centre" bulls would be satisfactory, having been proved getters of high yielding daughters, objections might still be met from those desiring to follow certain blood lines particularly for pedigree cows. They may desire their cows inseminated from a particular bull. As in usual practice the bulls are used once weekly only and the diluted fluids are reliable for a period less than one week, there will be times when cows cannot be treated from chosen bulls. For this reason, therefore, it is usual to keep more than one bull of a particular blood line. Even this precaution does not completely satisfy some farmers.

It is not always possible to determine the early onset of "heat," and therefore communication to the Centre may be delayed. Difficulties have occurred through accidents or temporary incapacity disrupting the planned movement of the technicians. The farmer is relying on an agency not under his own control.

Human nature is complex and rarely can one individual get ready acceptance and support from a wide group. The personality of the Manager of a Centre or of the Technicians may prove a disadvantage to some farmers.

There have been cases recorded where faulty organisation and technique directly attributable to inefficiency on the part of the Manager and Staff has caused considerable losses through low conception rates and faulty sires.

Difficulties.

There are many difficulties, however, under Australian and New Zealand conditions in spreading the use of the best bulls as widely as possible. These difficulties, however, should be possible of solution, but they cannot be tackled until an effort is made to establish Centres in districts where preliminary surveys show that primary conditions are suitable.

It is accepted generally that cow population must be concentrated before there is a reasonable chance of any scheme operating economically. Various inquiries suggest that the minimum number of cows for successful operation of a Unit is about 1,000, with estimates of the maximum number at from 1,500 to 5,000.

Consideration of the distance which it might be necessary to cover in order to attend the cows on a number of farms suggests that the maximum permissible distance should be not more than 20 miles, although up to 30 miles may be practicable.

Units cannot be established without preliminary expenditure on land, buildings, bulls, laboratory, equipment. In addition running expenditure would be incurred prior to there being any revenue from farmers. This would cover the cost of maintaining the property and feeding the bulls, salaries of the attendants and technicians and travelling expenses. Consequently a farmer-controlled Unit would necessitate the provision of capital in advance of the Unit being actually commenced. In co-operative associations in the United States, the practice is to charge members a preliminary fee, but there is little information to indicate whether sufficient support is obtained in advance of commencing operations to cover the financial commitments or whether assistance is obtained from financial institutions or from Government Agencies.

Another point which would affect the number of applications by farmers for membership would be the financial obligation which would be placed on them after a Centre was in operation.

Fees in England appear to have varied from 25s. to 30s. per cow got in calf, and it is unlikely that the costs in this country would be less. This has been a deterrent to some in developing interest, and there is no doubt that the annual demand of fees of this size would prevent others from agreeing to participate. However, this is not a sound reason. It has already been pointed out that the saving from not having to keep a bull on the farm would enable at least one additional cow to be kept. The profits from this cow would go towards the cost of the insemination fees. We could go further and say that the whole of the return from that cow could be considered an offset to the fees, as the cost of keeping the cow would not be more than keeping a bull. It may be of interest to make some estimation of the cost of keeping a bull. The following items may be included :—

The loss of income by keeping a bull instead of a cow may be assessed as being the value of 240 lb. butter fat. This average is higher than the average for our cows, but is adopted because of the special attention and feeding which is given to a bull and which should be sufficient to get this production from a cow. The value of the production loss, therefore, is .	£30
Special accommodation is necessary for a bull, and it would not be an over-estimation to say that £100 is expended in providing special sheds and yards and paddock fences for the animal—at 10 per cent. depreciation this would mean an annual cost of	£10
Annual maintenance of premises for a bull, and interest on the value of the animal are higher than for a cow. Further, the actual cost of replacement is greater. Ten pounds can be included to cover the cost of these items.	£10
Total cost for one year. .	£50

Thus we can calculate the actual cost per cow of keeping a bull. This will vary according to the number of cows for each bull.

In a 20-cow herd it is £2 10s. 0d. per cow.
„ 25-cow „ £2 0s. 0d. „
„ 30-cow „ £1 13s. 4d. „
„ 35-cow „ £1 8s. 6d. „

On a farm on which milk is produced for the Metropolitan Area, costs of keeping a bull calculated on this method are much higher. As an average of 240 lb. of butter-fat was taken in the previous case, 600 gallons is taken as the production lost through keeping a bull. If all milk is valued at 1s. 11d. the total costs would be £77 10s., which, when apportioned on a cow basis, gives the following : —

In a 20-cow herd it is £3 17s. 0d. per cow.
„ 25-cow „ £3 2s. 0d. „
„ 30-cow „ £2 12s. 0d. „
„ 35-cow „ £2 4s. 0d. „

It can be appreciated, therefore, that a possible fee range of 25s. to £2 or more should not be a deterrent to farmers being interested in having their cows stocked by animals of far higher quality than it would be possible for them to purchase.

In the preliminary stages of organisation in Australia, difficulty would most certainly be experienced in obtaining personnel with sufficient training. It is not necessary that those who are handling the bulls and carrying out the work of insemination should be qualified veterinarians, but they should have sufficient training to ensure that the work is done efficiently. Another difficulty which is experienced in many places and which would be encountered in Western Australia is

that of arranging easy communication between the farms and the Centre. A very ready system would be needed so that the farmer could be assured of having his messages delivered in sufficient time for the cows to be treated and at the same time enable the technicians to organise their day's operations.

Not the least important of the problems to be overcome is in the selection of suitable sires. It is easy to speak of using the best sires over the greatest number of cows, but it is not so easy to determine which are the best sires and even when they are located to be able to procure them for work at the Centre.

This information can be given only from a fully developed system of herd recording linked with sire surveys. It is an unfortunate fact that in most dairying districts the majority of successful dairy bulls are dead before their value has been recognised. In many places the farmer is reluctant to buy a mature bull. His interest is always in the young animal which has not been used previously. He is concerned with the butter fat backing and the ancestry of the bull, but there is no possibility of a young animal having been proved through his progeny before purchase.

The attitude of the farmers themselves can be another serious difficulty. Not all are prepared to agree to scrap their present system of breeding and join in an artificial insemination programme. The cautious ones want to see the experimentation carried out by the other man. They desire to see the system proved in their own conditions before becoming a party to the scheme. Apart from those who are genuinely interested but whose caution would hold them out temporarily, there are others whose lack of interest in herd improvement can be overcome only by an over-whelming demonstration of success in the majority of the herds. There is a natural reaction on the part of others to be independent of any outside assistance. All of these factors would reduce the number of herds which would be made available in any district at the inception of the scheme.

Overseas reports have shown how other difficulties occur.

The expansion of the one Exploratory Centre to embrace 3,000 cows in the near vicinity was delayed owing to low conception rates due to a toxic substance from the rubber in part of the collecting equipment.

Another factor contributing to low conception rates was the technique of insemination. It was shown that the uterine was superior to the cervix method.

Other difficulties have been associated with the seasonal character of dairying, which involves a heavy demand for the technician's services for a short period in each year.

The result has been that, in some countries, authorities seem to be forsaking temporarily, at least, the possibilty of using the best of the bulls over the whole of the herds. This is due to the paucity of really good bulls and the uneven call for service during the various seasons of the year.

The present approach appears to be in the direction of encouraging stud breeders to co-operate in the use of specially good bulls so that their sons may be available for natural service in commercial herds.

Data is accumulating throughout the world to show that the next best bull to the proved bull is the son of a proved bull. For example the Ayrshire Society in Scotland in a study of 731 proved sires showed that 82 per cent. had one or more proved sires in their nearest three male ancestors. Only 18 per cent. had no proved sires close up in the pedigree.

The Problem in Western Australia.

In considering the desirability of establishing a system of Artificial Insemination in Western Australia, it is necessary to take into account not only its potential value in improving production capacity more quickly than under a natural mating system but whether conditions render the organisation of efficient Centres practicable.

There is no doubt that, considering the dairying industry in this State dates only from 1920, excellent progress has been made. However, efficiency is as yet far behind dairying countries such as New Zealand and Denmark. There is in this fact a challenge to take advantage of the experiences of these countries so that further progress in this State may be more rapid than has been the case with them.

It is possible that the use of Artificial Insemination combined with improved husbandry practices will permit this to be achieved.

There are difficulties which may delay implementation. There is the question of finance. It appears improbable that farmers will provide the capital with which to initiate the service.

Frequent requests have been made by farmers' organisations for a Centre to be started by the Department of Agriculture. This would mean that the capital cost of the preliminary establishment would be found by the State Government. This is probable as it is intended that an Exploratory Centre will be established in the dairying areas as soon as practicable. The cost of distribution to the cows on private farms would naturally be the responsibility of the farmer, and there is no reason to expect that he would not be prepared to accept the full cost of this work providing it was not greatly in excess of the costs of natural mating.

This brings us to a consideration of whether it is likely that costs of distribution would be sufficiently low to warrant an expectation of full support of farmers. Reference has been made to the need for compact areas, and West Australia is only a sparsely settled country. Distances between farms and districts are greater than in most other dairying countries where Artificial Insemination has been successfully organised, but there does appear to be a number of districts where farms are sufficiently compact to warrant close examination. This and the difficulty of providing satisfactory communication with the Centre would be among the major difficulties.

The seasonal character of dairying, with a high incidence of early calving—over 70 per cent. of the cows calve in April, May, June and July—means that service would be required for a similar number of cows in July, August, September and October. If 2,500 cows per annum are considered a reasonable number for an inseminator where calving is spread throughout the year, it may be realised that difficulties would be experienced if 1,750 of these 2,500 had to receive attention during four months only. It would necessitate the employment of a larger number of men to cope with this seasonal activity, with insufficient work to keep them fully employed during the remainder of the year. Therefore, the possibility of higher costs being incurred through having men not fully employed would have to be considered.

Another very great problem would be finding sufficient bulls of quality. There are few " proved " to be outstanding in this State, and there is no guarantee that their owners would be prepared to let them go. There may be many others, but the data is not available demonstrating their worth. Experience wherever Artificial Insemination has been established has indicated that the finding of suitable sires has been the outstanding problem.

There are about 100,000 cows in our dairying areas proper, and, if we assume that 30 per cent. were to be included in a scheme ultimately, we would need 60 very good bulls. It is obvious we could not find them locally.

An experience in another State recently, where there is a very large cow population and where herd testing has been established on a wide scale for many years, proved that it was more than difficult to find proved bulls. The chances of finding them in other States would be most remote. Perhaps there are some in New Zealand, but we recall that there were only afew bulls during the period in which surveys had been made, which, in herds averaging 360 lbs. butterfat and over, had raised the level of yields in their progeny. Thus, as the New Zealanders are anxious to retain their proved bulls, and as there would be other prospective purchasers, the number we could hope to procure would be small.

Thus it is evident that a widespread scheme would not be practicable for some years to come and not before it was possible to select a large number of bulls proved good through their progeny performances.

Out of this argument comes one important point. " Proved " bulls are located by recording the performances of their progeny with or without a comparison with the yields of their mates. This information can come only from an efficiently organised system of herd recording which is used widely by dairy farmers.

The West Australian system has been improved, and heifers sired by pure-bred bulls are being marked for future identification, so that when they come into profit their productions may be tabulated according to their sires.

It would appear that the most practical method would be to purchase wherever they can be found *not a large number of bulls at fantastic prices* but a *few selected of outstanding quality*. Service to stud herds whose owners would be prepared to co-operate would be desirable so that sons of the good bulls would be available for natural service in commercial herds from which, after testing, those outstanding could be taken for wider Artificial Insemination schemes. During the preliminary period, Artificial Insemination would be restricted to commercial herds in the most compact and, therefore, economic centres.

A plan, therefore, would be to establish first of all a " pilot " centre where exploratory work with a single breed could be carried out. It would serve also as a training place for technicians. Later, as it proves practicable, the service could be extended to selected herds where owners were prepared to co-operate. If these included breeders of pedigree cattle, it would be so much the better. At this stage it should be a requirement that all herds should be recorded for production, so that a measure of the success of the scheme could be obtained. At the greatest, service from the Centre should be not more than 20 miles.

Later, the next step could be, to establish distributing centres at more distant points, which would be supplied with diluted fluids. At these centres equipment for holding supplies, a refrigerator, washing and sterilising facilities would be essential. A telephone and attendant would be necessary also. These distributing centres would operate as a main centre, with the sole difference that bulls would not be kept.

This system would involve keeping all bulls for several districts on one property, thus reducing costs for yards, handling, laboratory facilities, etc. This would facilitate administration and veterinary supervision of the bulls. Supplies could be despatched to the subsidiary centres daily or thrice weekly by public conveyance. Transport is so organised today that little difficulty would be expected in getting supplies to the centres which appear to have the greatest possibilities.

New settlement areas would present an unique opportunity for improving the herds of the settlers. In such a scheme, one could visualise a situation where a bull never entered a whole district. Supplies could be obtained from a bull-holding farm. It might prove desirable, however, even in such a new area to establish its own bull-holding farm from which local distributing centres would draw their supplies.

RATE OF MILKING WITH MACHINES

SOME RESULTS FROM WEST AUSTRALIAN HERDS.

M. CULLITY, Superintendent of Dairying.

MODERN knowledge of the physiology of milk secretion and the technique of milking, has directed attention to methods of using the machine which have an influence on yields, the likelihood of udder diseases, the tendency to make cows hard milkers and labour requirements.

Workers in research centres in the United States of America, notably Dalburgh of New York Experiment Station and Petersen of the University of Minnesota, have shown that most cows can be conditioned to give all their milk in from three and a half to five minutes and that they do not, in most cases, require hand-stripping. These results were achieved by conditioning the cows to let down their milk by a regular routine before teat-cups were put on and from the adoption of a method of removing the loose milk in the udder before the teat-cups were taken off. The fact that rapid milking will get more milk has also been confirmed.

Preliminary observations made by Recorder F. Coates of Pinjarra Herd Recording Unit in 1947–48, provide data justifying the belief that far too much time was wasted in milking and that machines were left on the cows too long.

If the position disclosed as existing in the Pinjarra district were characteristic of methods throughout the dairying areas, there obviously existed an opportunity for farmers to obtain more milk and reduce time in the milking shed by speeding up milking.

It was decided, therefore, to arrange for Recorders to measure milking times of all herds under test. This was done during monthly routine visits to farms in 1948-49.

Twenty four Recorders collected data from 451 herds. The method used was to record the time of commencing to handle the first cow and the time of the taking off of the teat cups from the last. The average time per cow was then calculated :—

$$\frac{T}{C} \times U$$

T = actual time taken to milk all cows.

C = number of cows.

U = number of units in the machine.

It is necessary to mention that farmers claim that milking takes longer when the Herd Recorder is present. This is admitted, and also the probability that more time is lost in some herds than in others because of the slight re-arrangement of normal organisation due to the use of test buckets on releasor machines and the need for the Recorder to have the separate quantities of milk from each cow for weighing and sampling. Accordingly the times recorded are somewhat longer than would be required under normal working conditions. However, the extra time included does not obscure the variations between farms in the speed of milking, or the fact that the rate on most farms is too slow.

Some details are given in Tables 1–4. Rates of milking have been grouped six minutes and under—6.1 to 9.9 minutes and ten minutes and over. No attempt has been made to differentiate between the times recorded for each make of machine. There is not sufficient data to warrant such an examination.

An examination of the daily data sheets shows a variation in milking times in the individual herds from four and a half to 18 minutes per cow.

In the grouped results for the various machines—see Table 1—there is a variation from five to 15.7 minutes per cow. It is obvious that there is gross inefficiency in some sheds. This is serious because of the probable damage to the milking capacity of the cows and to the wasteful usage of labour.

TABLE 1.

AVERAGE MILKING TIMES FOR VARIOUS SIZES AND MAKES OF MACHINE GROUPED ACCORDING TO TIME OF MILKING.

Make of Machine.	10 Minutes and Over.					6·1 Minutes to 9 9 Minutes.					6 Minutes and Under.				
	Average Milking Times (Mins.)					Average Milking Times (mins.)					Average Milking Times (mins.)				
	6	5	4	3	2	6	5	4	3	2	6	5	4	3	2
A			13·0					7·6	6·4	7·4				5·4	5·7
B				11 0				8·0	8 7				6·0		
C										7·1					5·5
D	12·5	13·6	11·8	10·9	10·7			8·2	6·4	6 7			6·0	5·8	5·5
E	10 7		11·6	12·2	11·4	8·0		8·3	9·1	7·5			6·0	5·7	5·3
F	11·0	15·7	11 5	11 2	11·4	8·5		7·8	8·1	7 5			5·1	5·2	5·0
G			10·2	11 1	12·5			7·0	8·0	7·4				6·0	5·6
H		11·0	11 0	12·4	10·0		9·2	8·1	7·5	7 3			6·0	5·2	5·2
I			12·3	11·0	10·1			8·2	8 2	7·7					5·3
J			11·9		10·0			7·5	7·1	7 5				5·2	5·3
K		10·8	10 2		10 4			8 9	7·5	7·5				5·4	6·0
L			10·0	11 4	11·3			7·5	7·7	7·6				5·5	5·3
M			11·4	10·0				8·4	7 3	8 0			6·0	5 7	4·7
N		12·2	12 9	11·0	10·0			8·8	7 5	7 5					5·5
O		12·3	12·2				7·5		7 1			5·5		5·2	
P									8·4						
Q										6 8					5·5
R										7·3					4·4
S								9 3							

It will be seen from Table 2 that there is a progressive lengthening of the time of milking as the machines get larger, as under :—

2	Unit machines	7.2 minutes per cow.
3	,, ,,	7.8 ,, ,,
4	,, ,,	9.3 ,, ,,
5	,, ,,	11 ,, ,,
6	,, ,,	11.2 ,, ,,

Further evidence that the smaller machines are being used more effectively is contained in the percentages of each size of machine which were successful in completing the milking process in six minutes or less. (Table 5.)

TABLE 2.

AVERAGE MACHINE MILKING TIMES FOR EACH MAKE OF MACHINE.

Machine.	Average Milking Time per Cow.									
	6		5		4		3		2	
	No. of Tests.	Mins.	No. of Tests.	Mins.	No. of Tests.	Mins.	No. of Tests.	Mins.	No. of Tests.	Mins.
A				. .	10	8 5	7	5·7	12	6·7
B	.				10	7 5	7	9·5	....	
C									8	6·1
D	6	12·5	10	13·6	97	9 1	173	7·0	170	7 1
E	4	10·7	.		74	9·8	309	8 8	390	6·5
F	6	10·2	4	15·7	60	9 1	135	8 5	83	7 8
G					4	7 7	42	8 9	110	8·0
H			7	10 4	34	8 7	16	8 2	20	7·0
I					17	11·9	19	10 0	60	7 5
J					12	11 0	10	8·0	23	7·3
K			5	10·8	4	9 2	21	6·6	16	8·0
L					14	7 9	76	8·2	202	8·3
M					11	9 5	36	7 3	19	7·0
N			2	12·2	5	12 4	3	7·5	24	6·3
O			6	7·5	1	12 5	7	6 6		
P							3	8 4		
Q							4	6 8	1	5 5
R				.					4	6 5
S					2	9 3				
Totals and Average Times	16	11 2	34	11·0	355	9 3	868	7·8	1142	7·2

See Table 1.

TABLE 3.

MILK PER COW PER MILKING, IN POUNDS, ACCORDING TO MAKE OF MACHINE AND TIME GROUPINGS.

Make of Machine.	10 Minutes and Over Units.					6·1 Minutes to 9·9 Minutes Units.					6 Minutes and Under Units				
	6	5	4	3	2	6	5	4	3	2	6	5	4	3	2
A			9·0	.		.		21·8	21·0	27·0				20·0	23·0
B				7·0				21·7	15 2	.			22·0		. .
C				.		.			20 2						.
D	22·5	20·6	24·4	20·3	12·3	.		22 0	21 5	24 4				24 4	22·2
E	31·0		24·0	23·5	26·0	11·0		27 6	21 7	23·5			: 8	25·0	24·8
F	25·5	22·0	20·8	23·0	19·0	29·0		20·0	23·5	21·0			: ·7	19 7	20 3
G	. .		13·7	27·4	21·0	.		13·5	24 3	22·0				15·0	20·0
H	...	26·0	23·1	17·7	17·5	. .	19·4	23 0	23 7	17·5			15·0	18·7	18·2
I		. .	21·8	22·0	22·8	.		19·0	21·4	22·3					22·0
J	.		24·5	.	15·0			22·0	21·3	23·4				18·0	25 8
K	...	24·0	27·0		24·7	...		24·0	18·3	24·2				14·3	20 0
L	...	.	26·0	20·6	27·7	. .		23·7	23 8	21·5		.		20 4	19 6
N	...		24·0	24·0		.		21·3	23·0	24·5		.	26 0	36 3	18 2
M	...	16·2	11·0	7·5	26·0	. .		15·5	15·0	24 0					21·0
O	....	24·0	22·0	..	....	.	26·7	.	24·0	....		24·3	.	20·0	....
P	...	....	....	. .	...	.	.	.	19·3			.	.	...	....
Q	....	....	. ..	. .	..	.	.		. .	24·0	.	. ..	. .	. .	15 0
R	....	....	....	....	...	....	..		.	24·3		. ..	.	.	16·0
S	....	....	....	....	....	....	. .	26·4	....	....	....	.	....	.	..

TABLE 4.

MACHINE MILKING TIMES—SUMMARY OF TABLES 1, 2 AND 3.

Machine Units.	Key.	10 Minutes and Over.	6·1 Minutes to 6·9 Minutes.	6 Minutes and Under.
6	No. of times machine recorded	10	6	..
	Average milking times	11·8	8·1	.
	No. of cows milking	440	410	.
	Average milk per cow per milking (lb.)	24·2	21·9	..
5	No. of times machine recorded	27	6	1
	Average milking times	15·3	8·2	5·5
	No. of cows milking	1133	281	134
	Average milk per cow per milking (lb.)	21·9	25·0	24·3
4	No. of times machine recorded	137	202	16
	Average milking times	12·4	8·1	5·6
	No. of cows milking	3965	7421	554
	Average milk per cow per milking (lb.)	23·9	23·5	24·7
3	No. of times machine recorded	145	635	85
	Average milking times	11·7	7·6	5·6
	No. of cows milking	2814	15293	3206
	Average milk per cow per milking (lb.)	22·4	22·1	22·5
2	No. of times machine recorded	92	771	283
	Average milking times	11·0	7·5	5·3
	No. of cows milking	1359	12836	5307
	Average milk per cow per milking (lb.)	20·5	22·4	22·1

TABLE 5.

PERCENTAGE OF VARIOUS SIZES OF MACHINES MILKING IN SIX MINUTES OR LESS.

Size of Machine Units.	Total Number of Tests.	Percentage six minutes or less.
2	19,502	24·7
3	21,313	8·8
4	11,940	4·5
5	1,548	2·9
6	850	..

An examination of tables 3 and 4 will show that longer milking times have not been due to larger flows of milk as in most cases as much milk was obtained with the short period of milking as with the longer periods. This is shown by the summarised results in Table 6.

TABLE 6.

QUANTITIES OF MILK FOR EACH SIZE OF MACHINE IN TIME GROUPINGS.

Size of Machine Units.	10 minutes and over.	6·1 to 9·9 minutes.	Six minutes and under.
6	24·2	21·9	....
5	21·9	25·0	24·3
4	23·9	23·5	24·7
3	22·4	22·1	22·5
2	20·5	22·4	22·1

The position becomes still more clear by an examination of the quanities of milk obtained per minute by each size of machine in the various time groupings. See Table 7.

TABLE 7.

POUNDS OF MILK OBTAINED PER MINUTE.

Size of Machine Units.	10 minutes and over.	6·1 to 9·9 minutes.	6 minutes and under.
6	2·05	2·7	....
5	1·43	3·0	4·4
4	1·9	2·9	4·4
3	1·9	2·9	4·0
2	1·86	3·0	4·2

It is, of course, likely that with the longer periods all the milk was drawn long before the teat cups were removed and thus the rates per minute given above may not be strictly accurate as a measure of rate of flow. Even so the fact remains that the teat cups were left attached longer than necessary and time was wasted together with considerable risk of injuring the cow or at least making her a hard and slow milker.

Some idea of the time wasted and its value at current award rates may be gauged from the data in Table 8, showing conversions of the average milking times into the equivalent of eight hour days over a lactation period of 273 days.

TABLE 8.

VALUE OF TIME WASTED IN SLOW MILKING.

Size of Machine Units.	Time required to Milk One Cow.		Excess Time Over five Minutes per Cow.		
	Minutes per Milking.	Eight hour days per Lactation.	Eight hour days.	Value.* Per Cow.	Value.* Per 30 Cows.
				£ s. d.	£ s. d.
2	7·2	8	2¼	1 19 3	58 17 6
3	7·8	9	3¼	2 16 8	85 0 0
4	9·3	10½	4¾	3 14 0	111 0 0
5	11·0	12½	6¾	5 17 8	176 10 0
6	11·2	12¾	7	6 2 0	183 0 0

* At current award rate of £6 2s. per week of 56 hours.

These figures seem to emphasise the extreme importance of the labour cost which can be wasted by slow milking or poor organisation in the bails. In addition to this, is the probable loss of production because of the failure to take advantage of the let down to milk thoroughly. No assessment of this loss can be made.

Where the farmer is employing labour the loss through wastage of time will appear to be very evident. Where he is doing the work himself or is assisted by his family, the financial loss may not appear to be so great, but he is certainly losing the opportunity of carrying out other farm activities which would help him to increase production or else improve his property.

There is no evidence to suggest that the longer times recorded mean that the teat-cups are on the cows for the whole of this period, as a considerable loss of time occurs due to the method of handling the cows in the shed. With modern "walk-through" bails and no hand-feeding, very little time need be lost in transferring the teat-cups from one cow to another, but frequently time is lost because of delay in bringing the cows in or in undertaking sundry other jobs in the diary or its vicinity during milking.

There is sufficient information in the figures to show that in many cases farmers have over-equipped their sheds with units. In several cases herds of equal size have been milked as rapidly by 2-unit machines as those with 4-units or larger. In other words, too many units have been installed for the labour that is available. This probably is the most important explanation for the rise in milking time per cow with the increase in the number of units.

In view of the high cost of labour, farmers naturally are interested in making the most effective use of that available. This can be done by adopting a regular routine at milking time so that the cows will come to the shed when required and they can be turned out again conveniently after the machines are removed.

To enable the most efficient routine to be adopted, it is desirable that the sheds and yards be laid out with the greatest degree of convenience so that there will not be any unnecessary confusion to the cows, either in bringing them into the shed or in turning them out. It is desirable also for the farmer to study the lay-out of bails in relation to the milk room and wash-up room so that the time required to attend to the separator and the bails is not greater than necessary. Considerable time and energy can also be saved by the development of a routine in doing all the tasks associated with the preparation of the cows, the handling of the teat-cups and the attention to the milk room.

BETTER DAIRYING COMPETITION, 1949-50

THE Australian Dairy Produce Board Pasture Improvement Committee (W.A.) is conducting a Better Dairying Competition, with a view to encouraging better dairy practice, and in particular the greater conservation of fodder, and pasture production.

The Dairy Belt is divided into seven Zones, full information being obtainable from the local Dairy Officer, or from the Dairy Branch, Department of Agriculture, Perth.

Zones are as follow :—

Zone 1—Coastal.

Zone 2—Bunbury-Donnybrook.

Zone 3—Busselton-Margaret River.

Zone 4—Bridgetown.

Zone 5—Manjimup-Northcliffe.

Zone 6—Great Southern.

Zone 7—South Coastal.

Four prizes will awarded in each Zone as follows :—

First Prize	£20 and framed certificate.
Second Prize	£12
Third Prize	£8
Fourth Prize	£6

Judging will be carried out by Officers of the Dairy Branch, Department of Agriculture, on the following basis :—

		Points.
1.	Conservation of Fodder and Summer Crops	280
2.	Pastures	240
3.	Dairy Herd	150
4.	Return of Butter Fat, etc., per acre	120
5.	Pigs	30
6.	Farm Management	130
7.	Utilisation of Skim Milk	50
	Total	1,000

Where a competitor sells his product in liquid milk form, the scale of points will be adjusted so as to place him on a relative basis with competitors who supply cream to a butter factory.

Prize winners in the 1948-49 Competition will be handicapped as follows :—

		Points.
First Prize Winner	deduct	15
Second Prize Winner	,,	10
Third Prize Winner	,,	5
Fourth Prize Winner	,,	1

ZONE 6—GREAT SOUTHERN.

In this Zone the Competition will be in the form of "Fodder Conservation" judged on the following basis :—

	Points.
Fodder conserved per head of dairy cows	100
Use of Phosphatic Licks	25
Silage or Summer Fodder Crops	50
Sanitation of Dairy Premises	25
Total	200

Where both silage and fodder crops are provided, the scale of points to be halved in these sections so that the total in these sections shall remain 50.

Entries are free and close on 30th September, 1949.

Entries should be made to the Superintendent of Dairying, Department of Agriculture, Perth, or the District Agricultural Adviser.

Judging will commence on 1st November, 1949, and will be completed by 28th February, 1950.

ALBANY AGRICULTURAL AND HORTICULTURAL SOCIETY PASTURE AND MEADOW HAY COMPETITIONS 1948-49.

C. W. TOBIN, Dairy Instructor.

For the third year in succession the Albany Agricultural and Horticultural Society conducted Pasture and Meadow Hay competitions in the Albany district, and once again the Society is to be commended for its interest in these activities.

The number of entries was below usual for the apparent reason that the whole district has embarked on a new clearing and pasture expansion programme, and with outside labour for this work not available it must be undertaken by farmers who find it difficult to participate in all the opportunities offering.

Seasonal conditions were generally favourable with early opening rains, a normal winter followed by warm weather and showers in the spring. In spite of this there was a noticeable deterioration in subterranean clover pastures on some properties.

The whole of the pasture on each property was judged in late November and February in order to more accurately assess the position with regard to stocking and management. An entirely different picture is presented in February to that in November when all pastures are in their prime, and with two inspections a fairer result can be obtained.

The quality of Meadow Hay showed a slight improvement on past years. Power mowing and baling is becoming more popular and is assisting quality and quantity conserved for the reason that the crops can be handled in less time. However, there still is in most cases a large gap between amount conserved and amount adequate to meet requirements, and it is here competitors generally lose the greatest number of points.

The prize winners in this year's competitions are as follows:—

PASTURE CLASS.

Competitor	Density and evenness of sward 60	Absence of weeds and insect pests 25	Botanical composition 40	Management 75	Total 200
F. Pease, Torbay	52	22	36	73	183
Farr Bros., Youngs Siding	53	22	36	71	182
R. B. Wilkinson, King River	50	22	34	70	176

F. Pease.—This property consists of 70 acres of pasture sub-divided into 17 paddocks carrying subterranean clover, rye grasses, paspalum and a little kikuyu. Subterranean clover is weaker than usual but this is consistent with other competitors. The rye grasses are strong and healthy and on most of the paddocks made nice even growth.

Fodder conservation in hay, silage and maize at the rate of between two to three tons per cow shows management to be commended.

Stocking comprised of 25 cows and eight other cattle, all in good condition on both inspections.

Fertilising was at the rate of approximately 210 lb of superphosphate per acre.

Farr Bros.—The property has 130 acres of pasture made up of 100 acres of old established subterranean clover, rye grasses and patches of kikuyu, and 30 acres of second year clover sown on the burn on part cleared redgum–jarrah country. The old pasture continues to stand up well, and the new is increasing in density.

Fodder conservation this year is light and leads one to believe that the herd may be increasing too quickly for the expansion of the pasture area. If this happens a fall in butterfat production is inevitable.

The stock on the property amounted to 46 cows and 56 other cattle.

Fertilising was at the rate of three cwt of superphosphate per acre.

R. B. Wilkinson.—This property consists of 175 acres of established pasture part of which is sub-divided into small paddocks for rotational grazing, and there is a further area of newly sown clover. The old pasture comprised of mixed clovers, paspalum and kikuyu on the low country is in very good condition, but the surrounding hillsides leave room for improvement in species and density. A heavier clover crop could be expected, and the introduction of grasses into these paddocks is recommended.

Stock amounted to 28 cows and 37 other cattle.

Fertilising was at the rate of 1 cwt of superphosphate per acre and it is reasonable to believe that heavier dressings of fertiliser would improve results.

MEADOW HAY CLASS.

Competitor	Botanical Mixture 20	Type and palatability 30	Time of cutting 25	Aroma 10	Amount per cow 15	Total 100
F. Pease, Torbay	17	25	22	8	15	87
R.B.Wilkinson King River	18	26	22	8	9	85
Farr Bros., Torbay	18	22	21	7	6	74

F. Pease.—Three stacks of hay were inspected, one being a carry over from the previous year. The mixture was mainly clover and rye grasses, fairly well made and in good condition.

Conservation of fodder is a strong point with this competitor and the amount conserved per cow enabled him to score full points in this section.

R. B. Wilkinson.—This entry comprised mainly of baled hay from a late cut off summer land plus a small stack carried over. The new hay consisting of late grasses and clover was in good condition and well made. The old stack had deteriorated but was in fair order.

The quantity conserved fell short of what is considered adequate, i.e., 2½ tons per cow.

Farr Bros.—The mixture was quite good but variable in colour and condition as affected through being out too long prior to baling.

The quantity conserved was a long way short of requirements.

BACONER CARCASS COMPETITION

STATE AND ZONE CHAMPIONSHIPS

THESE competitions are sponsored by the Australian Meat Board and are conducted with the co-operation of the Department of Agriculture, The Royal Agricultural Society, The Farmers' Union, The Bacon Curers' Association, The Meat Export Establishments (Spearwood, Bellevue and Albany), Western Australia, and the Commonwealth Department of Commerce and Agriculture.

For the purpose of the competitions, the State has been divided into six zones, in which separate competitions will be held and from which the prize winners will compete for Championship Prizes.

The accompanying map shows the boundaries of each zone.

AWARDS.

The following awards will be made :—

State Champion	£21—plus trophy valued at £15.
Reserve Champion	£10—plus trophy valued at £5.
First prize each Zone ..	£10
Second prize each Zone	£5
Third prize each Zone ...	£1

Subject to the entries being in the opinion of the judges, of sufficiently high standard.

Pigs should be despatched to the normal export killing works and will be received at each of these works at any time between July 13 and September 14.

The animals will be held for 48 hours before slaughter, carcasses will be marked for identification and chilled.

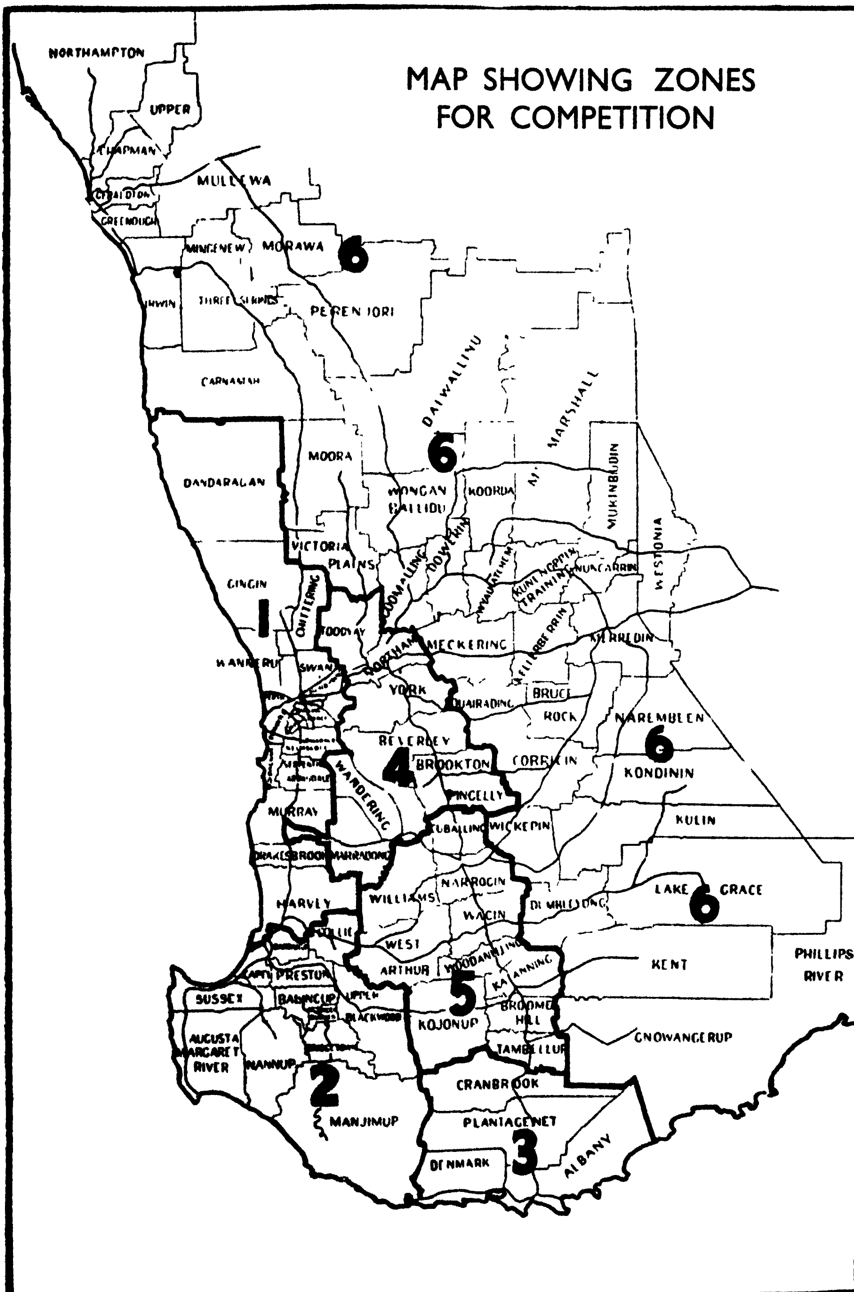
Arrangements will be made for the display of carcases on Thursday, October 6 (during the Royal Show week), at which time the prizes will be distributed. The display will be made at a point to be determined, and competitors will be advised accordingly.

CONDITIONS.

1. The competition to be open to all pigs sired by a pure bred boar. Entries to be accepted only from the owners of the pigs entered who also must be their breeders—that is, the owners of the sows when the entered pigs were born. Entries to be made on the printed Entry Form and all particulars set out on the form to be completed.
2. Each entry to consist of *one* animal.
3. Entries to be restricted to not more than *two* from any one owner.
4. To be eligible for the competition, the carcasses must come within the weight range of 120–180 lbs. *chilled* dressed weight including heads.
5. The carcasses shall be judged by the Hammond appraisal system (breeders' points only).
6. Any contract of sale or purchase of the carcasses shall be made between the entrant and the killing works at which pigs are slaughtered.
7. Compensation for mutilation : The Board undertakes to pay the factory ½d. per lb. dressed weight including heads to compensate for mutilation in judging.
8. Entries to close on September 1, 1949, and forms to be addressed to State Representative, Australian Meat Board, Box R1278, G.P.O., Perth.
9. The decision of the Board or any person nominated by them to judge or to decide any disputes that may arise in connection with these conditions or the conduct of the competitions shall be accepted by entrants as final.

10. Intending competitors should advise the works to whom the pigs are being consigned, full details regarding numbers being forwarded, whether by rail or road, and identification marks.

11. If any further details are required by intending competitors, contact should be made with the office of the State Representative, William Street, Perth.



THE RUNT AND ITS PLACE IN PIG HUSBANDRY

V. B. MONTI, Dairy Instructor.

WE are all familiar with the runt or runts in a litter and the problem is how can these undersized and unprofitable pigs be eliminated.

The pig to foster is the one that shows a profitable return over feed and labour. There are two main stages in the development of a piglet, the development within the uterus and the growth and development that takes place after birth. This creative condition is controlled by the two factors, heredity and environment.

Heredity of course will have most effect on the unborn piglet, but it is well known that certain families have the inherent power of making much more gain per pound of dry food comsumed than pigs from other families. Seeing that the inherent characteristics are out of the control of the breeder once the mating is performed it behoves him to select his breeding stock with the greatest of care, selecting only from those families which farrow a large number of normal sized, healthy piglets, having the inherent capacity for the most economic utilisation of food consumed. Selecting also from a sow that is a good mother and one with a copious milk supply. If the proportion of runts from any matings are abnormally high and there are no environmental factors contributing, then the parent stock should be disposed of.

Environment will effect piglets during pregnancy but its effect will tend to be the same on all pigs in the litter while the generic factors influence the individual. Once the pig is born size is an important factor, for, as a rule, the stronger pigs select the breast teats where the milk flow is strongest and the weaker piglets tend to be forced on to the rear teats where there is less milk and hence their progress is still further retarded.

Because pigs are small at birth it does not signify they will continue to be backward. In large litters it is only natural that the pigs on the average are going to be smaller, but if they possess the necessary inherent qualities and are fed a supplementary ration, a satisfactory weaning weight should be attained. The provision of creep feeding as soon as the piglets show the slightest inclination to feed is the surest way of ensuring satisfactory growth. If this supplementary feeding is not supplied, a litter may soon be noticed to split into two factions, the one, obtaining sufficient nourishment from the mother at the expense of the weaker ones which rapidly degenerate into a group of undernourished runts. The numbers in this latter group usually predominating the litter. This latter group will never make satisfactory growth after weaning and this factor makes all the difference in the profit or loss obtained. Therefore always provide creep feeding. Under-nourished pigs are also more prone to infection and losses from deaths are very liable to occur. Even if death does not result the infected animals are always unthrifty.

Anaemia is a common disease of sty fed piglets that are reared on concrete or other impermiable floor. If the piglets have not the access to a pastured run or an earth portion in the sty, a few shovelfuls of good clean earth should be supplied daily or some other iron supplement fed.

The provision of a well grassed run is one of the safest methods of ensuring a healthy well growing litter.

With the obvious runt which will not respond to good husbandry, it is better to dispose of it before it has consumed time and food unprofitably.

CLOVER DISEASE

PRACTICAL FINDINGS AND RECOMMENDATIONS FOR CONTROL.

F. L. SHIER (1) AND R. C. ROSSITER (2)

DURING the past few years an infertility in ewes together with other breeding troubles and abnormalities of the sex organs of sheep became a serious problem in certain regions in Western Australia where pastures are composed predominantly of early (Dwalganup) subterranean clover.

Briefly the manifestations are *infertility*, or failure of ewes to get in lamb ; *dystocia*, a condition affecting ewes which have conceived but which make little or no attempt to deliver their lambs and fail to do so ; and *prolapse* and inversion of the uterus (turning inside out of the womb), which occurs typically in the Spring, some months after the lambing season. The infertility results in a progressive decline in lambing which may, in the course of a few years, fall to below 20 per cent. ; the dystocia results in death of the unborn lamb and a ewe mortality or wastage of up to 30 per cent.; while prolapse may lead to a 10 per cent. wastage.

Other manifestations are lactation in unbred ewes and in wethers. Wethers may also die from urinary obstruction--a small percentage may show a "false bladder" visible externally as a large fluctuating swelling in the crutch ; this is almost invariably fatal.

In the March 1946 issue of the Journal of the Department of Agriculture of Western Australia, an account was given of the various manifestations of this disease, the extent of the problem, the knowledge obtained up to that time, together with a number of practical suggestions which it was felt should tend to minimise the overall effects of the disease and keep the total productivity of affected properties somewhere near their normal level.

Since then an intensive investigation has been continued by a team of workers into the pathological, chemical, agrostological and field aspects of the disease. A considerable body of scientific data and a much better understanding of the whole problem has been obtained. Many points still remain obscure and it would appear that much further patient investigation and experimentation will be necessary before this very complex problem, which has resulted in high losses on some properties and at one time appeared to threaten the sheep industry of the 20-25 inch rainfall area of this State, is fully understood.

The more scientific findings have been published by several workers in technical journals from time to time and these have been listed at the end of this article. Here it is proposed to deal only with those points which have a bearing on the practical side of the problem and its control in the light of present knowledge, in the form of a non-technical publication for the general guidance of farmers. This has been considered desirable in view of the additional scientific data now available. It should be pointed out, however, that although we are far from a complete understanding of all aspects of the problem, present experimental data strongly support the broad general recommendations made in the article referred to above.

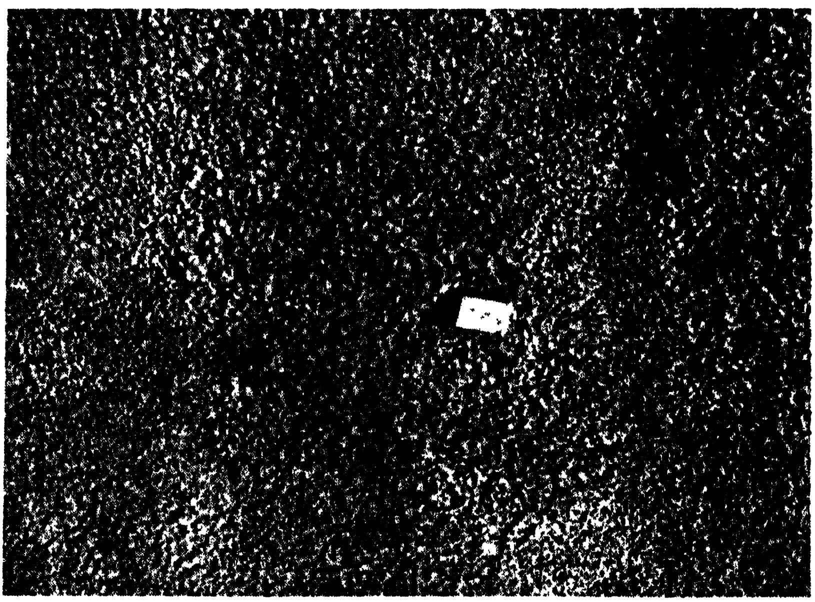
This article has been prepared by the authors in collaboration with other members of the W.A. Technical Committee on Sheep Infertility.

(1) Assistant Superintendent of Wheat Farming, Department of Agriculture.
(2) Senior Research Officer, Division of Plant Industry, C.S.I.R.O.

PRESENT KNOWLEDGE—PRACTICAL ASPECTS

1. The disease is of nutritional origin. It is not due to any infectious organism or the toxins produced by bacteria and eaten by sheep and consequently control cannot be expected by the development of an immunising vaccine such as is the case with entero-toxaemia (braxy-like disease) or botulism (toxic paralysis).

2. The disease results from the grazing of subterranean clover dominant pastures. It has been shown that the clover contains a potent substance which has an action on the sheep identical with that of one of the sex hormones, oestrogen. The sex hormones are chemical substances produced, normally, by certain glands in the animal body. They severally control and maintain the various reproductive processes and organs. The continued preponderance of one type of hormone, resulting from the ingestion of potent clover, completely upsets the hormone balance controlling the various reproductive processes. This also induces gross abnormalities in the sex organs of the ewe, notably a cystic condition of the uterus, and also of the wether. The exact nature or chemical composition of the factor or factors is not yet known.



Dominant subterranean clover. Clover disease could be expected in sheep grazed on this pasture during the green period. This is best utilised for meadow hay production and summer grazing.

3. The effect of this green subterranean clover grazing is progressive, in the case of ewes. Some cystic condition of the uterus (womb) has been demonstrated in ewe weaners after their first season on green subterranean clover. The degree to which these young ewes have been effected is not great, but it is apparently sufficient to reduce fertility somewhat at their first mating twelve months later, even if they were not on a dominant clover diet during their second winter and spring.

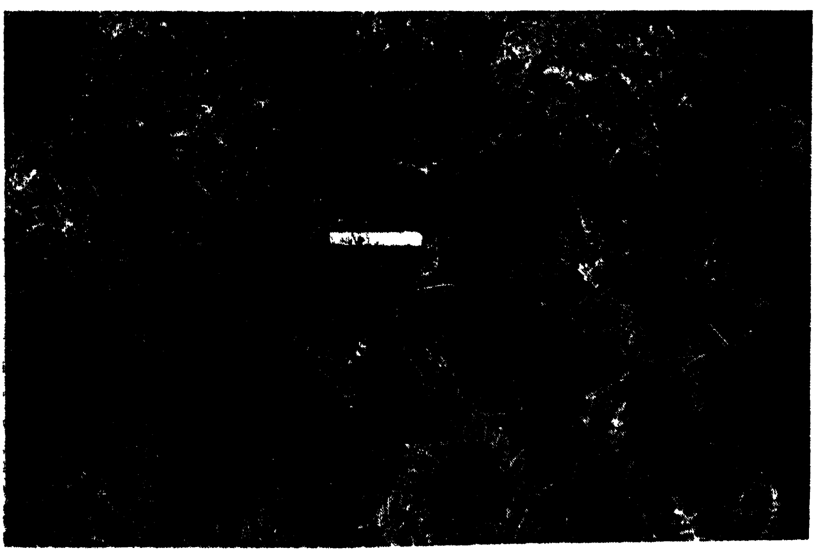
Two seasons of green clover grazing are sufficient to have a distinct effect on the fertility of ewes when mated as two tooths and some incidence of dystocia frequently occurs at lambing time. Maiden four-tooth ewes (mated at 2½ years) following three seasons on green clover are markedly affected, showing definite infertility and generally a high degree of dystocia at lambing of those ewes which had conceived.

4. These effects on the sex organs and fertility of the ewe are largely permanent. Maiden four-tooth ewes and infertile six-tooths (which had not produced a lamb at their first mating) from an affected property exhibited the major manifestations of the disease (infertility and dystocia) at three successive matings on a "sound" area (Merredin) where there was no subterranean clover grazing.

5. The clover appears to be highly potent throughout the green growing period but there is a rapid fall in potency after wilting.

Dry clover and clover hay have been found to contain very low amounts of the potent substance and can be consumed by ewes and wethers with impunity.

6. The other plant species of the affected region such as oats, Wimmera rye grass, other annual grasses, capeweed and small "native" clovers even in the green stage, do not contain sufficient of the potent substance to produce the harmful effects. As subterranean clover is unpalatable during the dangerous green growing period sheep maintained on a mixed pasture will, by selective grazing, avoid the consumption of harmful amounts of clover.



A well balanced pasture containing Wimmera rye grass and some cape weed in addition to subterranean clover. Clover disease would be unlikely in sheep grazed on this pasture.

7. Rams are unaffected. This is no doubt due to the counteracting effect of the male sex hormone (testosterone), produced by the testicles, which is antagonistic to oestrogen. The effect of testosterone injected into wethers, grazing potent pastures, has been demonstrated experimentally.

The high cost of this substance and other practical considerations, however, absolutely preclude its use for the control of "clover disease" in any of its manifestations.

8. Factors influencing the production of the potent substance in subterranean clover have been studied extensively and are still receiving consideration. It appeared possible that genetic or environmental factors might influence potency and that if so the disease might be controlled by the use of other (non-potent) varieties of subterranean clover or, for example, by appropriate manurial treatment of the soil.

The evidence to date strongly suggests that, in the West Australian environment at any rate, all varieties of the clover wherever grown will be dangerous in the green stage, and that sheep will develop "clover disease" if they have a dominant ration of such material for a sufficiently long period.

9. Although earlier evidence from some properties suggested that crossbreds were less susceptible to infertility and dystocia, than were merinos, recent experience indicates that the former may be equally affected. It is quite definite that the changing over to crossbreds cannot be recommended as a means of controlling the disease.

10. It appears extremely unlikely that the sudden onset of the disease in 1941 was due to any direct effect of war time superphosphate—such as an excess (as an impurity in the superphosphate) or deficiency of a particular element causing the production of the potent factor in clover. The reduced amounts of superphosphate available for topdressing at that time may have tended to produce more dominant clover pastures indirectly, by reducing the overall productivity of the pastures which in turn results in heavy selective grazing by the sheep of the smaller amounts of the more palatable non-clover species.

11. Cattle and horses bred and maintained on affected properties have shown no evidence of "clover disease."

CONTROL.

It is evident that sufficient information has been accumulated to suggest a system of farm and sheep management which should give a considerable measure of control of "clover disease". This must be based, obviously on measures designed to prevent sheep from regularly eating excessive amounts of green subterranean clover. During the last three or four years many farmers have developed more mixed pastures for their sheep in order to avoid dominant green clover grazing. This has (quite naturally) produced no beneficial effects on their older and "affected" sheep but farmers who had previously suffered severe losses in their breeding flocks from this disease report marked improvement in their younger sheep which have been maintained under the modified system of management recommended. A very significant feature of the field evidence in the last two years has been the general low incidence of dystocia and prolapse even on properties which had suffered severely in the past.

If we accept the evidence that the content of the potent substance in green subterranean clover is not materially influenced by variety or soil, then obviously the only means of control of the disease short of completely removing the clover is by pasture and sheep management.

For a number of reasons which it is unnecessary to discuss in this article, subterranean clover is likely to remain an essential component of the pasture if a sound system of agriculture is to be maintained over the region under review. Research work on the problem must continue until a complete understanding of the many at present obscure scientific aspects is worked out. This will include a further investigation of the possibility of producing less potent clover by the use of other varieties, or by manurial treatment or the like.

Whatever the results of these investigations it is strongly contended that appropriate modifications of husbandry practices, even if not 100 per cent. effective, will undoubtedly result in a much more productive system of farming with greater total returns that have been obtained on farms in the past where sheep have been grazed on more or less dominant pasture periodically topdressed with superphosphate.

PRACTICAL RECOMMENDATIONS.

1. Dominant clover paddocks should not be grazed in the green period. Such grazing can produce permanent effects in ewes and result in some ill-health and possible losses in wethers. Clover dominant paddocks can be reserved for summer grazing but are best utilised for meadow hay.

2. If the lambing percentage of a particular flock has dropped to very low figures, say 10–15 per cent., it is inadvisable to continue breeding from such ewes. The small percentage of lambs would be more than offset from possible losses from dystocia. It would be best either to keep them unmated solely for wool production or to sell them on the fat stock market.

3. Where the lambing percentage is about 40–50 per cent. it is suggested that at each tailing time all dry ewes be suitably raddled and later mated separately. Those which fail to lamb after this mating, that is after two consecutive matings, should be culled from the breeding flock and disposed of as indicated above. One farmer by such a programme, associated with appropriate pasture management, has improved his lambings from 30–35 per cent. to a normal 70–75 per cent. for the two lambings subsequent to culling.

4. A system of ley farming should be instituted on clover dominant areas with the dual objective of obtaining greater total productivity and a more balanced grazing for the stock. Wheat is very profitable at the present time and in most affected districts could be used as the first crop. This may be followed with advantage by a "scratched in" crop of oats and Wimmera rye grass using the sunderseeder or combine, and would provide a large bulk of good mixed winter and spring grazing. If the paddock is not grazed too heavily in late spring and early summer ample Wimmera rye grass seed should be set to provide a good mixed pasture in the following year.

5. Pasture improvement should be energetically pursued throughout the clover areas. This should include the introduction and encouragement of species other than clover, such as Wimmera rye grass. Good management of the pastures should

be followed with attention to such items as topdressing, the avoidance of over-grazing of the more palatable species, particularly during the seed setting stage, and periodic renovation with the use of "scratched in" crops of oats.

6. Baby beef production based on such breeds as the Aberdeen Angus, Red Poll or Beef Shorthorn could be developed with distinct advantage as one of the activities on many farms at present carrying only sheep.

TECHNICAL PAPERS ALREADY PUBLISHED.

"A Specific Breeding Problem of Sheep on Subterranean Clover Pastures in Western Australia."

H. W. Bennetts, E. J. Underwood and F. L. Shier—*Australian Veterinary Journal.*—Vol. XXII, Feb., 1946.

"Metaplasia in the Sex Organs of Castrated Male Sheep Maintained on Early Subterranean Clover Pastures."

H. W. Bennetts.—*Australian Veterinary Journal,* Vol. XXII, June, 1946.

"A Further Note on Metaplasia in the Sex Organs of Castrated Male Sheep on Subterranean Clover Pastures."

H. W. Bennetts.—*Australian Veterinary Journal,* Vol. XXII, January, 1947.

"Oestrogenic Action of Extracts of Subterranean Clover (Dwalganup)."

D. H. Curnow, T. J. Robinson and E. J. Underwood.—*Australian Journal of Experimental Biology and Medical Science,* Vol. XXVI (1948).

"Oestrogenic Effects of Subterranean Clover (Dwalganup): Protective Action of Androgen in the Castrate Male."

June East, E. J. Underwood and H. W. Bennetts.—*Australian Journal of Experimental Biology and Medical Science,* Vol. XXVII (1949).

"Oestrogenic Potency of Subterranean Clover (Dwalganup): The preparation and Assay of Extracts."

T. J. Robinson.—*Australian Journal of Experimental Biology and Medical Science,* 1949 (in press).

BACONER CARCASS COMPETITION.

M. CULLITY, Superintendent of Diarying.

THE Australian Meat Board inaugurated Baconer Carcass Competitions in 1948 in order to assist in reorientating producers' approach to the production of carcasses suitable for export.

Work of this nature was in hand by all authorities in Australia prior to 1939, but owing to the need during the war for all kinds of meat and fats in as great quantities as could be produced, emphasis on quality production lessened.

While there is still a huge demand for all kinds of meat in Great Britain, it is logical to look forward to the day when supplies will be more adequate and discrimination fully exercised by buyers, in respect to quality.

In the last few decades there has been a trend in consumer-demand towards smaller and leaner joints, with the natural consequence that extra large and fat carcasses have claimed lower prices than those providing cuts of the right size, with plenty of lean meat, balanced with a nice proportion of fat.

The Competitions were organised with the object of encouraging the production of the most suitable types of pigs, and of assisting the various State Extension Services in demonstrating what is needed.

A Committee, representative of the Board, the Pig Breeders' Society, the Bacon Curers, and the Departments of Commerce and Agriculture (Commonwealth), and Agriculture (State), was formed to supervise the organisation in W.A.

The State was divided into Zones (see map, page 109) and prizes offered in each Zone. A State Championship Award to the best entry in all Zones was offered also.

Each Competitor was allowed to make two entries comprising two pigs in each. For 1948 only, farmers were permitted to forward three pigs. All pigs were appraised according to the Smithfield System and the best two were taken as the entry.

Judging of the Competition was carried out on the Smithfield System (Breeders' points only), as devised by Messrs. H. R. Davidson, John Hammond, Jas. B. Swain, and Nevill L. Wright. The "Breeders' Points" only were used because nearly all killing and treatment was carried out at the one Works, and as the competition was for the farmer's part in producing the carcass any defects due to treatment and which would be penalised under "Marketing Points" could not be considered the responsibility of the farmer. Similarly the section for "Suitability of Carcass Weight" was ignored as a special weight range had been stipulated and entries falling outside this range were liable to disqualification.

For the benefit of past and future competitors in these competitions a description of the method of carcass appraisal is given.

The system was devised by English Pig Authorities to meet the requests from overseas countries for reports on the suitability of carcasses despatched to England. It was appreciated by overseas exporters that the trend in consumption-demand was towards joints with a high proportion of lean meat and a low proportion of fat. It was impossible to express with accuracy the characteristics of a carcass in these respects from a visual inspection of the carcass or a side.

Therefore the reporters mentioned above, realising not only the difficulties of accurately assessing quality of carcasses, but also the need for explicit reports, endeavoured to evolve a simple and uniform system.

Over a period of years they investigated the subject and, becoming increasingly aware of the inadequacies of visual judgment, endeavoured wherever possible to obtain a measurement to express a point so eliminating the variations due to the personal element.

In this way a scale of points was built up, which were intended to express as accurately as the guidance of innumerable dissections would permit, the value of a carcass in respect to its content of lean meat and fat.

There were three points, however, "hams," "shoulders," and "streaks," regarding which it was not possible to devise satisfactory standards of measurement. As a substitute photographic standards were prepared for comparison with the actual carcasses, as a means of minimising errors in visual appraisal.

The following is an extract from the investigators' report, describing the method :—

The scale of points and marks adopted for both pork and bacon is as follows :—

TABLE 1.

—	Marks.	
	Porkers.	Baconers.
(1) Marketing Points—		
Colour—clean, fresh, white	5	5
Skin—smooth and fine	5	
Dressing—freedom from bruises and hair	5	5
	15	10
(2) Breeders' Points—		
(a) By Inspection:		
Hams—well filled and fine boned	8	8
Shoulders—light	7	7
Streak—thick, full of lean meat	12	12
(b) By Measurement:		
"Eye muscle" of Loin—thick	28	28
Back Fat thickness—correct proportion	20	20
Body Length—in proportion to weight	20	20
Leg Length—short	5	5
	100	100
(3) Suitability of Carcass Weight	..	15
Total Marks	115	125

The relative number of marks given to each point has been carefully considered according to the relative market value of the point. For example, a carcass poor in the "eye muscle," or thickness of lean meat, can drop many more points than one which is thick in the shoulders. The sum total of the points therefore represents the desirability of the carcass from a market point of view. The standard set is a high one, and any carcass which obtains over half marks on any point is a good one in that respect.

JUDGING BY EYE APPRAISAL.

STANDARDS FOR AWARD OR MARKS.

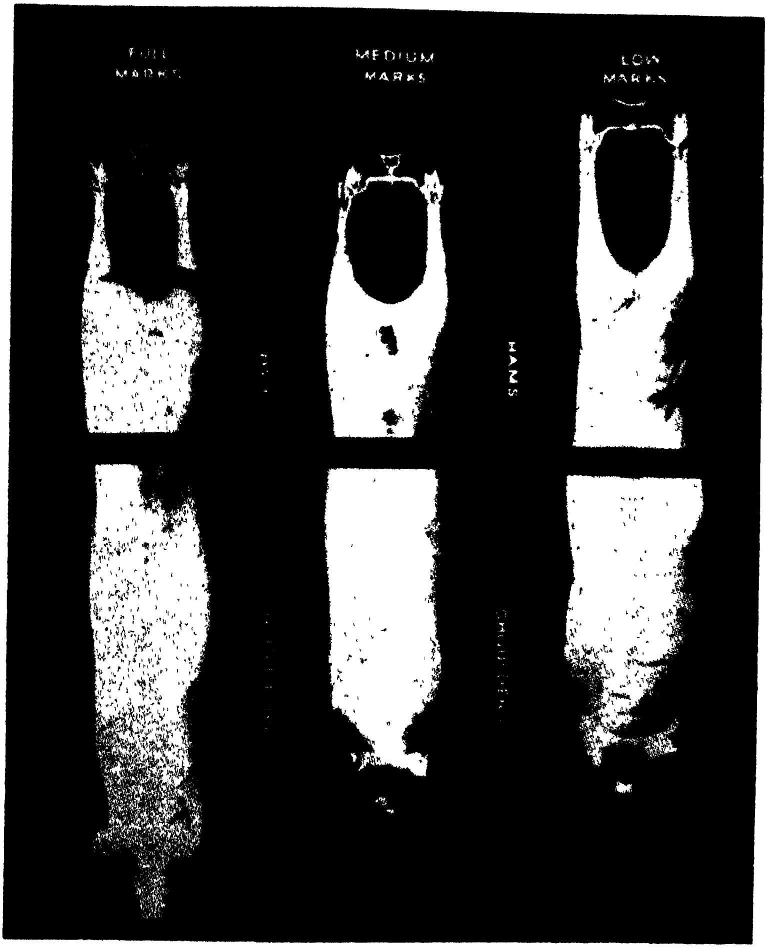


Fig. 1.

JUDGING IN THREE STAGES.

The judging is carried out in three stages:—

(a) The carcasses are weighed and are hung up in a row with their backs to the judge. The Marketing Points (Colour, Skin and Dressing) and the Hams and Shoulders of the Breeders' Points are then judged.

(b) Each carcass is then sawn down the middle line, and the Body Length and the Leg Length are measured with a tape measure graduated in millimetres.

(c) One side of each carcass is then sawn straight through at the level of the last rib, and the hinder ends are laid out in a row with the cut surfaces facing the judge. On the exposed cut surface the Streak is judged, and the "Eye Muscle" and Back Fat are measured by fine pointed callipers and read off on a wooden ruler scale in millimetres.

The level of the last rib has been selected to make this cut, for not only does it expose the most valuable part, but also the latest developing part of the carcass. A part which grows late during development of the animal forms the best index of the state of the development of the carcass as a whole.

STANDARD FOR AWARD OF MARKS.
BY EYE APPRAISAL.

STREAK (BACONER).

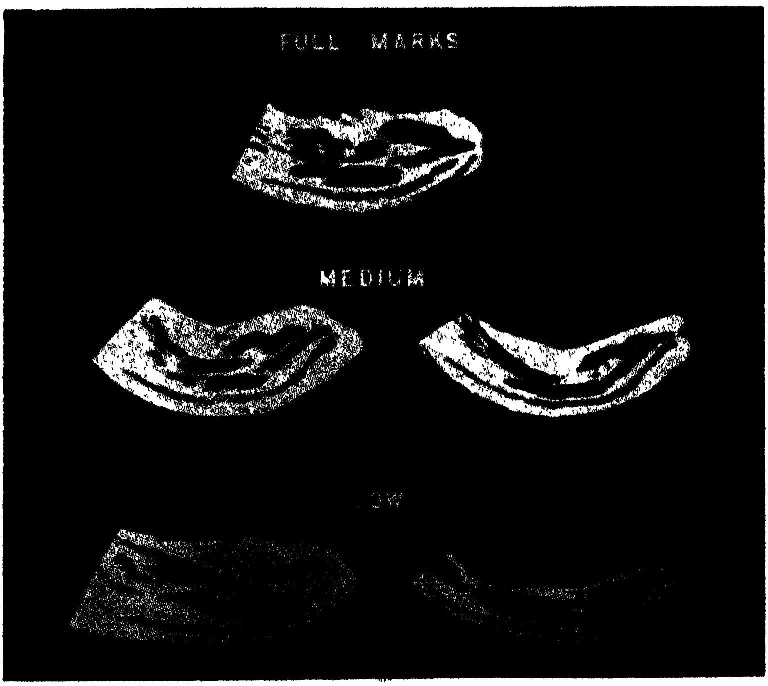


Fig. 2 (Bacon).

Where the method is employed for reporting to overseas senders rather than for carcass competitions in Great Britain, photographs of the carcasses arranged as described in paragraphs (a) and (c) above, together with the score card of the measurements and marks awarded, form a means of keeping a permanent record of the experimental consignment or competitions. In practice, these are sent back to the Government Departments, Recording Societies, Agricultural and Pastoral Associations, and producers concerned so that they can see for themselves in how far their pigs are meeting the demands of the consumer.

THE SCALE OF POINTS EXPLAINED.

A brief description of the points and the methods used in judging them is as follows :—

(1) *Marketing Points.*

Colour (5 *marks*).—The colour should be clean fresh white. Points should be deducted for dark colouration due to pigmented skin, sunburn before slaughter, or excessive drying in storage, as well as for the dead white blebs found as faults in cold storage.

Skin (5 *marks*).—The skin should be smooth and not too thick or coarse.

Dressing (5 *marks*).—Bruises and weals due to fighting before slaughter should be absent. There should be complete absence of all hair and absence of scraper cuts in the skin. The method of allowing the fore legs to hang naturally is preferable to hooking them back, as the latter makes the shoulders appear heavier than they are.

(2) *Breeders' Points.*

(a) *By inspection :* For these photographic scales are used (*see* pages 119 and 120).

Hams (8 *marks*).—The bone should be fine and the ham well filled out with lean meat, the space between the legs being U-rather than V-shaped. The hams to be judged are compared with the photographic scale of hams (Fig. 1) which shows the shape for maximum (8), minimum (1) and intermediate (4) marks, to be awarded.

Shoulders (7 *marks*).—These should be light in proportion to the rest of the carcass for it is a low-priced part. In judging, the shoulders are matched against a photographic scale of the shoulders (Fig. 1) which shows the shape for maximum (7), minimum (1) and intermediate (4) marks, to be awarded.

Streak (12 *marks*).—Not only should the belly be thick, but it should contain a high proportion of lean meat. Comparison with the photographic scale (Fig. 2) is made. The maximum marks (12) are given for a streak which is *both* thick and full of lean meat. The minimum marks (1) are given *either* for one which is thin, *or* for one which is thick but which contains a high proportion of fat. Illustrations of intermediate marks (6) in each case are also shown.

(b) *By measurement :* Measurement in millimetres rather than in inches (25 millimetres = 1 inch) has been adopted for the sake of greater accuracy and the avoidance of fractions. Since the actual measurement will vary with the weight of the carcass, Tables 2 to 5 have been drawn up for different wieght groups. From these tables the marks corresponding to any particular measurement can be read off. In the case of thickness of eye muscle and length of body, the highest marks are given for the maximum measurement, and in the case of the length of leg for the minimum measurement. For thickness of fat, on the other hand, as for suitability of carcass weight, the highest marks are awarded for an optimum measurement.

"*Eye Muscle*" *of Loin* (28 *marks*).—The thickness is measured half way along its width (*see* Fig. 3). This gives the best measure of the thickness of lean meat throughout the carcass. Different carcasses vary much more in the thickness than in the width of the muscle, so the thickness has been selected as the index of lean meat. The scale for converting measurements to marks is given in Table 2.

Back Fat Thickness (20 *marks*).—This is measured one inch for porkers and one and a half inches for baconers from the middle line, with one point of the callipers at the edge of the " eye muscle " and the other just on the inner layer of the skin (*see* Fig. 3). This gives a better measure of the amount of fat in the carcass than does the measurement of the fat at the shoulder, for it is the last part of the back fat to develop. Fat differs from all other points for marking, inasmuch as for each weight group of carcass there is an optimum requirement of back fat ; there can be too little as well as too much. Consequently the scale for converting measurements to marks (Table 3) unlike the others, is extended on both sides of the optimum. In the case of pork, if the carcass is too fat the rind and the fat down to the required thickness has to be removed. It is therefore more profitable to supply this small

JUDGING BY AWARD OF MARKS FROM MEASUREMENT.

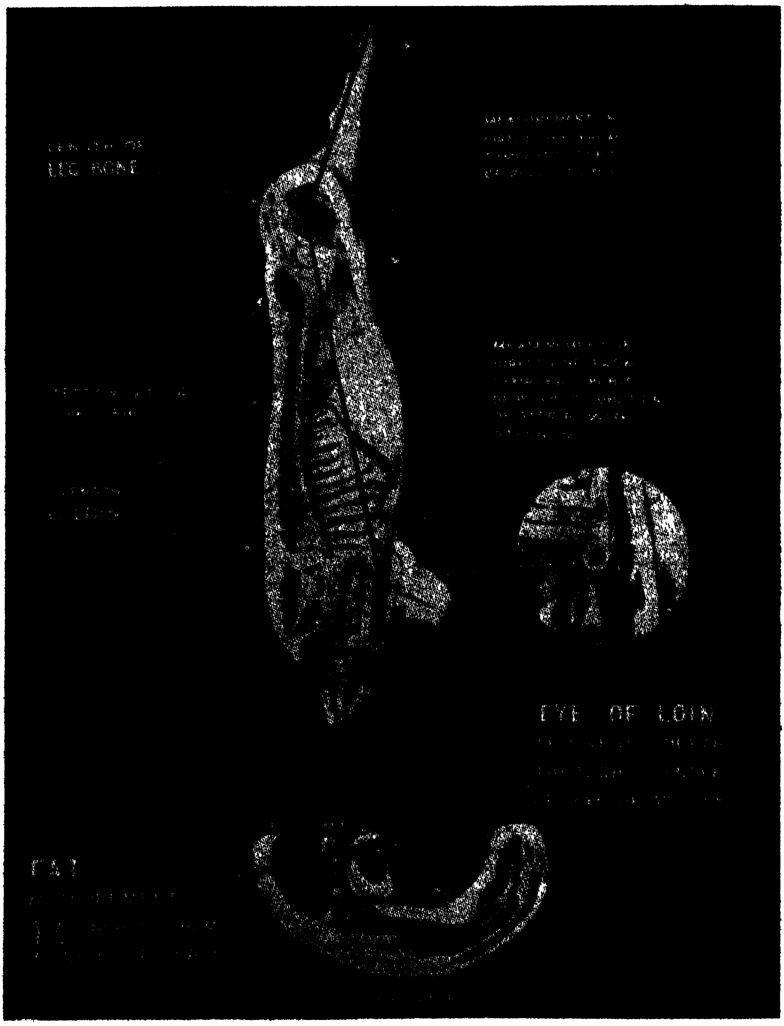


Fig. 3.

pork, for which there is a growing demand in industrial areas, with the right amount of fat, so that it can be sold direct to the consumer with the rind on. At one time we considered the measurement of the thickness of the back fat from the point of the "eye muscle" farthest from the backbone to the skin, as it is here that the thickness of the fat shows up in the cut. Agreement was good when all measurements were taken by one person, but not when they were taken by different persons, for it is more difficult to judge the exact point at which the measurement should be taken here than in the place which we have adopted.

Body Length (20 *marks*).—This is measured with a tape measure from the edge of the symphysis pubis bone to the junction of the sternum with the first rib (see Fig. 3). It gives a measure of the length of the valuable loin joint which can be cut off the carcass. A high proportion of this to the weight of the carcass as a whole increases the value of the carcass for cutting purposes. The scale for converting measurements into marks is given in Table 4.

Leg Length (5 *marks*).—This is measured with a tape measure in a straight line from the edge of the symphysis pubis bone to the tip of the toe (*see* Fig. 3). When taken in relation to the weight of the carcass it gives a measure of the amount of bone in the carcass. The scale for converting measurements to marks is given in Table 5.

ONE OF THE CHAMPIONSHIP CARCASES.

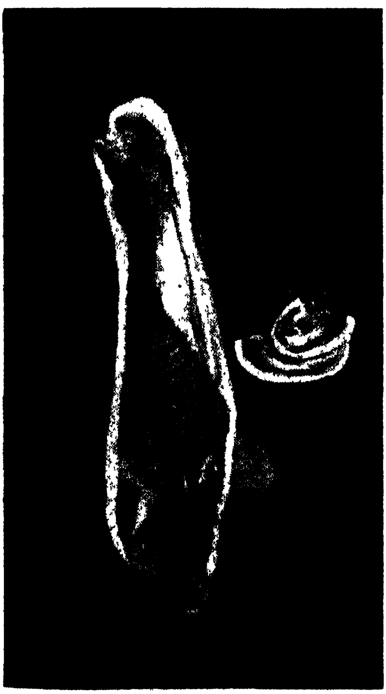


Fig. 4.

ONE OF THE POOR CARCASES.

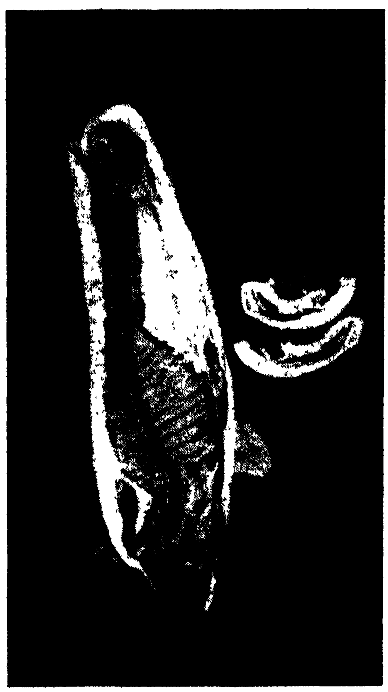


Fig. 5.

TABLE 2.

MARKS FOR THICKNESS OF EYE MUSCLE OF LOIN.

Measurements in Millimetres.

Carcass weight, lbs.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 99	100 to 109	110 to 119	120 to 139	140 to 159	160 to 179	180 to 199
Marks													
1	23	24	25	26	27	28	29	30	31	32	33	34	35
3	24	25	26	27	28	29	30	31	32	33	34	35	36
5	25	26	27	28	29	30	31	32	33	34	35	36	37
7	26	27	28	29	30	31	32	33	34	35	36	37	38
9	27	28	29	30	31	32	33	34	35	36	37	38	39
11	28	29	30	31	32	33	34	35	36	37	38	39	40
13	29	30	31	32	33	34	35	36	37	38	39	40	41
14	30	31	32	33	34	35	36	37	38	39	40	41	42
15	31	32	33	34	35	36	37	38	39	40	41	42	43
16	32	33	34	35	36	37	38	39	40	41	42	43	44
17	33	34	35	36	37	38	39	40	41	42	43	44	45
18	34	35	36	37	38	39	40	41	42	43	44	45	46
19	35	36	37	38	39	40	41	42	43	44	45	46	47
20	36	37	38	39	40	41	42	43	44	45	46	47	48
21	37	38	39	40	41	42	43	44	45	46	47	48	49
22	38	39	40	41	42	43	44	45	46	47	48	49	50
23	39	40	41	42	43	44	45	46	47	48	49	50	51
24	40	41	42	43	44	45	46	47	48	49	50	51	52
25	41	42	43	44	45	46	47	48	49	50	51	52	53
26	42	43	44	45	46	47	48	49	50	51	52	53	54
27	43	44	45	46	47	48	49	50	51	52	53	54	55
28	44	45	46	47	48	49	50	51	52	53	54	55	56

TABLE 3.

MARKS FOR THICKNESS OF FAT OVER LOIN.

Measurements in millimetres.

Carcass weight, lbs.	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 to 149	150 to 159	160 to 169	170 to 179	180 to 189	190 to 199
Marks														
1	1	1	2	3	4	5	7	8	9	10	11	12	13	14
4	.	2	3	4	5	6	8	9	10	11	12	13	14	15
7	2	3	4	5	6	7	9	10	11	12	13	14	15	16
10	3	4	5	6	7	8	10	11	12	13	14	15	16	17
12	4	5	6	7	8	9	11	12	13	14	15	16	17	18
14	5	6	7	8	9	10	12	13	14	15	16	17	18	19
15	...	.	.		.	.	. .	14	15	16	17	18	19	20
16	6	7	8	9	10	11	13	15	16	17	18	19	20	21
17	..	..	. .	.	.	. .	14	16	17	18	19	20	21	22
18	7	8	9	10	11	12	15	17	18	19	20	21	22	23
19	8	9	10	11	12	13	16	18	19	20	21	22	23	24
20	9	10	11	12	13	14	17	19	20	21	22	23	24	25
19	10	11	12	13	14	15	18	20	21	22	23	24	25	26
18	11	12	13	14	15	16	19	21	22	23	24	25	26	27
17	...	...	....	. .	...	....	20	22	23	24	25	26	27	28
16	12	13	14	15	16	17	21	23	24	25	26	27	28	29
14	13	14	15	16	17	18	22	24	25	26	27	28	29	30
12	14	15	16	17	18	19	23	25	26	27	28	29	30	31
10	15	16	17	18	19	20	24	26	27	28	29	30	31	32
7	16	17	18	19	20	21	25	27	28	29	30	31	32	33
4	17	18	19	20	21	22	26	28	29	30	31	32	33	34
1	18	19	20	21	22	23	27	29	30	31	32	33	34	35

TABLE 4.

Marks for Body Length (Symphysis pubis to First Rib). Measurements in mms.

Carcass Weight lbs.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to 109	110 to 114	115 to 119	120 to 124	125 to 129	130 to 134	135 to 139	140 to 144	145 to 149	150 to 154	155 to 159	160 to 164	165 to 169	170 to 174	175 to 179	180 to 184	185 to 189	190 to 194	915 to 199
Marks																												
1	550	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820
2	555	565	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825
3	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830
4	565	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835
5	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840
6	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845
7	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850
8	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855
9	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860
10	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865
11	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870
12	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875
13	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880
14	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885
15	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890
16	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895
17	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900
18	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905
19	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900	910
20	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905	915

TABLE 5.

Marks for Leg Length (Symphysis pubis to Toe). Measurements in mms.

Carcass Weight lbs.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to 109	110 to 114	115 to 119	120 to 124	125 to 129	130 to 134	135 to 139	140 to 144	145 to 149	150 to 154	155 to 159	160 to 164	165 to 169	170 to 174	175 to 179	180 to 184	185 to 189	190 to 194	195 to 199
Marks		and o	ver																									
1	450	460	470	480	490	500	510	520	530	540	550	560	570	575	580	585	590	595	600	605	610	615	620	625	630	635	640	645
2	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	559 to 550	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615	629 to 620	634 to 625	639 to 630	644 to 635
3	439 to 430	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	559 to 550	564 to 555	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615	629 to 620	634 to 625
4	429 to 420	439 to 430	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	554 to 545	559 to 550	564 to 555	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615
5	419	429 and	439 under	449	459	469	479	489	499	509	519	529	539	544	549	554	559	564	569	574	579	584	589	594	599	604	609	614

TABLE 6.

BACONER CARCASS COMPETITION, 1948.

Owner.	Breed.	Principal Feeds, etc.	By Inspection. Weight.	Ham.	Shoulder.	Streak.	By Measurement. Eye Muscle.	Back Fat.	Body Length.	Leg Length.	AV.
		ZONE 1.									
C. D. Palthorpe, Pinjarra ...	Tamworth—(Tamworth × Berkshire)	Skim milk and pollard, some pasture	148.5	4.5	6	11.5	25	19.5	10.5	3.5	80.5
		ZONE 2.									
J. W. Hutchins, Northcliffe	Large White (Large White × Tamworth)	Skim milk and pollard with green feed	152	7.5	7	11.5	17.5	17.5	9.5	3	73.5
W. J. Moriarty, Capel ..	Tamworth—Canadian Berkshire	Pollard, crushed wheat, skim milk	134	7	4.5	10	21	18	9.5	3.5	73.5
C. A. H. and V. M. Heathcote, Northcliffe	Canadian Berkshire .	Skim milk, pollard, crushed grain, green feed	170.5	5.5	4.5	11.5	22.5	18	7.5	3.5	73.0
J. T. N. Downes, Northcliffe .	Large White	Skim milk, pollard, bran and pasture	163	7.5	5	12	14	18	9.5	2.5	68.5
Summerlea Pastoral Co., Capel	Berkshire—Crossbred	Skim and butter milk and crushed wheat	168.5	6.5	6	12	17.5	11.5	13.5	1.5	68.5
W. J. Moriarty, Capel .	Tamworth—Canadian Berkshire	Pollard, crushed wheat, skim milk	123.5	6	5	11	15.5	17.0	8.5	3.5	66.5
E. J. Stapleton, Noggerup .	Large White—Grade Large White	Skim milk, crushed wheat, grazing	162.5	6	5.5	9	13.5	17.5	11.5	2	65
S. C. Maidment, Balingup	Canadian Berkshire	Skim milk, crushed wheat, grazing	172	7	5.5	7.5	20.5	15.5	4	5	65
Summerlea Pastoral Co., Capel	Berkshire—Crossbred	Skim and butter milk and crushed wheat	145	5	5	8.5	15	17	10.5	2.5	64
Alex. Poad, Dardanup	Tamworth—Large White	Pollard, bran, skim milk, wheat to top off	139.5	6	6	12	7	15.5	15	2	63.5
R. P. Reading, Vasse ..	Large White	Crushed wheat, skim milk and grazing	132.5	6.5	7	9	12	12	12	2.5	61
E. J. Stapleton, Noggerup	Large White—Grade Large White	Skim milk, crushed wheat, grazing	136.5	6	7	8.5	10	17	9.5	1.5	59.5
E. K. Evans, Jindong .	Large White—Wessex Saddleback	Crushed wheat soaked in skim milk	134.5	6	6	9.5	14	11	8	2	56.5
E. K. Evans, Jindong .	Large White—Wessex Saddleback	Crushed wheat soaked in skim milk	147.5	6	6	8.5	19.5	6.5	5	2	53.5
		ZONE 3									
A. K. Stirling, Kendenup	Berkshire	Skim milk, crushed wheat and grazing	153	8	4.5	8.5	21.5	18.5	14	5	80
A. K. Stirling, Kendenup ...	Berkshire	Skim milk, crushed wheat and grazing	127	8	4	9.5	18.5	19	15	5	79
F. R. H. Pugh & Son, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Skim milk, crushed wheat	145	7	5.5	9	23.5	19	6	5	75
L. M. Pugh, Narrikup .	Tamworth, Berkshire .	Milk and wheat, grazing	135	6	5	9	16	17.5	11	5	69.5
Research Station, Denmark .	Berkshire	Buttermilk and crushed wheat	176	4	7	12	20	13.5	11.5	1	69.0
J. Pugh, Narrikup	Canadian Berkshire—Tamworth	Milk and grain, grazing	126.5	5.5	6	12	12.5	17.5	9.5	5	68
Research Station, Denmark	Berkshire .	Skim milk, buttermilk, crushed wheat	140.5	5	5	7.5	20.5	15.5	12	2	67.5
F. R. H. Pugh & Son, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Skim milk and crushed wheat	133.5	6.5	4.5	7.5	21.5	14	8	5	67
R. F. Pugh, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Milk and crushed wheat	146.5	6.5	4	10.5	20	17	1.5	5	64.5

L. M. Pugh, Narrikup	Canadian Berkshire (Tamworth × Berkshire)	Milk and wheat, grazing ...	144	6.5	3.5	9	17	15.5	7.5	5	64
F. Pugh, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Skim milk, crushed wheat ..	147.5	6 5	5	10	20.5	9	6	5	62
J. Pugh, Narrikup .	Canadian Berkshire—Tamworth	Milk and grain, grazing	135.5	6.5	6.5	9.5	14.5	11	8	5	61
R. F. Pugh, Narrikup ..	Canadian Berkshire (Large Black × Tamworth)	Milk and crushed wheat .	160	7.5	6	8	16	7.5	3	5	53
		ZONE 4.									
R. and J. Overheu, Brookton	Canadian Berkshire	Creep fed, crushed barley, oats, wheat and 10% meatmeal	166 5	6 5	5 5	9.5	15	16 5	14.5	3.5	71
R. and J. Overheu, Brookton	Canadian Berkshire	Crushed barley, oats, wheat and 10% meatmeal	136	6	5 5	8.5	13	18 5	12.5	2	66
W. G. Burges, Burges Siding	Canadian Berkshire	Crushed wheat and meatmeal	176 5	7	7	7	15	17	7	5	65
Muresk Agricultural College, Muresk	Berkshire . ..	Wheat, barley. meatmeal, mineral supplement	141.5	7.5	2.5	10	16 5	12	7 5	5	61
W. G. Burges, Burges Siding	Canadian Berkshire .	Crushed wheat and meatmeal	164 5	6	5	6	14 5	16	7	1	55.5
A. G. Marshall, West Pingelly ..	Tamworth (Tamworth × Berkshire)	Crushed wheat, oats, barley, meatmeal and skim milk	142 5	5 5	7	5.5	11		9.5	2	40.5
		ZONE 5.									
J. W. Moyses, Piesseville	Tamworth (Large White × Large Black)	Crushed wheat, oats and meatmeal green feed	153.5	7	7	10	18	5.5	3.5	3.5	54.5
		ZONE 6.									
Dunlop Tolerton, Kellerberrin	Large White (Canadian Berkshire × Large White)	Bran, pollard, whole wheat. green feed	146	5 5	6	10	21	16.5	14	3.5	76.5
Dunlop Tolerton, Kellerberrin	Large White	Bran and pollard, whole wheat, green feed	158	7.5	5.5	4	8	12	5	3	45

In the Competition conducted in 1948 there were 37 entries :—

Zone 1	1
Zone 2	14
Zone 3	13
Zone 4	6
Zone 5	1
Zone 6	2

This was an encouraging response, but with one disappointing feature. Of the 37 entries, 28 were received from dairying areas and only nine from the Great Southern Railway and wheat-belt districts.

As the pig industry generally may be considered to be divided almost equally between dairying and non-dairying areas, with some fluctuations from time to time due to varying prices of pigs and grain, the response from Zones 4, 5 and 6 were surprisingly low.

All entries were forwarded to Watsons Supply Stores' Bacon Factory, Spearwood, and the Albany Freezing Works. Carcasses from the latter were sent to Spearwood where judging was carried out on the October, 1948.

The Judges were Messrs. H. A. Watson, Fewster and M. Cullity, assisted by Mr. R. A. Paul.

A demonstration of the carcasses was held at the Bacon Factory on Thursday, 7th October. This was followed by the presentation of trophies by Mr. R. B. Williamson.

The State Championship was awarded to C. D. Pailthorpe of Pinjarra who was the only entrant in Zone 1. Details of the entries and the points scored in each section are given in Table 6.

DISCUSSION OF THE RESULTS.

1. *General.*

For the guidance of competitors who may be misled by what they consider the low-scoring of their pigs, it must be emphasised that it is exceptional for a carcass in any competition to score more than 80 points. The system of appraisal is designed having in mind the perfect carcass. In practice, a carcass scoring 60 points or more is considered excellent.

In this competition there were eight entries only which could not be considered to be of merit. Nine entries scored more than 70 points, with two over 80 points.

A comparison of points scored in this competition with those in similar competitions in Victoria and South Australia for 1948, indicates the average for this State was only very slightly below the others. A comparison of the best three entries shows that the average here was slightly superior. Even if allowance is made for possible variations in the allocation of points, particularly in the sections for visual judgment, the result cannot be other than reassuring for the breeders in this State and gratifying for those who have led in the efforts to improve the quality of West Australian pigs over the past twenty years.

2. *Breeds.*

An examination of the results has been made on two bases, firstly, according to the breed of the sire and, secondly, the actual breed or cross of the entry itself. The detail is shown in Tables 7 and 8.

It is appreciated that the sample of entries is too small to permit of the drawing of definite conclusions, but where there are indications at times supporting observations, it is considered advisable to make comment.

TABLE 7.

BACON CARCASS COMPETITION, 1948.

Average Percentages according to Breed of Boar.
Two Carcasses from each entry.

Breed of Boar.	No.	Weight.	Ham.	Sh'lder.	Streak.	Eye Muscle.	Back Fat.	Body Length.	Leg Length.	% Average
Maximum Points			8	7	12	28	20	20	5	100
Berkshire	42	151.2	80	72 5	76 7	63 7	76.2	44 3	78 1	66.6
Tamworth	14	139 4	75 0	82 6	82 1	57 9	66 4	48 1	65 7	64.0
Large White .. .	18	147.6	83.0	86.6	76 8	54.3	67 1	45 0	52 8	62.2

TABLE 8.

PERFORMANCE OF BREEDS AND CROSS BREEDS.

Percentage of Maximum Points.

Breed.	No. of Entries.	Weight.	Ham.	Sh'lder.	Streak.	Eye Muscle.	Back Fat.	Body Length.	Leg Length.	Total.
Maximum Points										1,000
Berkshire pure breed	11	156.7	80 1	72 7	73.8	63 7	82 0	51 1	69.0	68.3
Berkshire × Tamworth	5		77.5	77 1	85 8	49 6	82.0	43 5	88 0	67 9
Berkshire × Tamworth × Berkshire	3	152 5	90 9	69 0	81.9	60 1	73 3	52 5	60 0	65 5
Berkshire × Tamworth × Lge. Black	5	146 5	85 0	71 4	75.0	72 5	66 5	24 5	100	64.3
Tamworth × Berkshire × Tamworth	2	145 5	62 5	92.8	94 4	64 2	47 5	50 0	55 0	60 24
Tamworth × Large White	1	139 5	75 0	85.7	100.0	25 0	77 5	75 0	40 0	63.5
Tamworth × Large White × Large Black	1	153 5	87 5	100 0	83 3	64 3	27 5	17.5	70 0	54.5
Large White × Berkshire × Large White	1	146 0	68 7	85.7	83 3	75 0	82 5	70 0	70 0	76.5
Large White × Tamworth × Large White	1	152.0	93 7	100 0	95 9	64 3	90 0	47 5	60 0	74.5
Large White × Large White × Unknown	2	149 5	75 0	89 3	97 0	41.9	86 2	52 5	35.0	62.2
Large White pure bred	3	151.0	97 9	83 3	69.4	40.5	70 0	44 2	53 8	58.2
Large White × Wessex Saddleback	2	141.0	75 0	85.7	75 0	58 0	43 75	32.5	40 0	55.0

It will be noted that there were 42 pigs, or 56.7 per cent. of the total submitted, sired by a Berkshire boar and that these scored higher with 66.6 points than the other two breeds which were represented. Tamworths with 18.9 per cent. of the entries averaged 64 points, while the Large Whites, with 24.4 per cent. of the entries scored 62.2 points.

In Table 8, further information is given of the performances of the various breeds and cross-breds. It will be noted that the two highest averages are credited to a Large White × Berkshire × Large White, and a Large White × Tamworth × Large White Sows. In each case, however, only one entry is represented and their performance is marred by the relatively unsatisfactory appraisals for the carcasses of the pure-bred and other Large White crosses.

The best performance was undoubtedly that of the pure-bred Berkshires, which scored an average of 68.3 points. An examination of the detailed score sheet (Table 6), will show that these carcasses scored consistently in each section and reference is made to points gained over various Berkshire crosses in the sections "back-fat" and "body length."

This is interesting in view of the total change in the character of the Berkshires in this State in the last twenty years, following the importation of Canadian and New Zealand improved strains, which characteristically had greater length than the type which it replaced.

The Berkshire-Tamworth crosses, the first-cross and the back-cross to the Berkshire, were only slightly inferior. There were no pure-bred Tamworths submitted so no direct comparison can be made, but reference can be made to the tentative conclusions from experimental work and earlier competitions that the quality of the good type improved Berkshire was not improved by crossing with the Tamworth. There is, however, the possibility which experience and observation tends to support, that the first-cross, in particular, grow more rapidly and more economically than either pure-bred. This may be due to hybrid vigor, but there is no experimental data to justify the conclusion.

3. *Carcass Quality.*

(a) *Visual Inspection.*—(i) *Hams.*—The average points scored were relatively high. There was considerable variation, however, in some cases the hams were unfinished and not filled out.

(ii) *Shoulder.*—The score also in this section was reasonably good. Most carcasses were well-formed and lean. In a few cases only was there any coarseness.

(iii) *Streak.*—The evaluation of the streaks showed generally good scoring. Layers of lean were interspersed with fat. Most streaks were thick enough.

(b) *Measurement.*—(i) *Eye Muscle.*—The measurements were in many cases surprisingly good. The weakest pigs in this section were certain of the pure Large White and their crosses.

It should be mentioned, however, that the best carcass for "eye muscle" was also a Large White-Berkshire-Large White cross.

Other combinations represented in two entries or more to score well were the pure Berkshire (11 entries), Berkshire × Tamworth × Large Black (5 entries), Berkshire × Tamworth × Berkshire (3 entries), and Tamworth × Berkshire × Tamworth (2 entries).

(ii) *Back-fat.*—Greater variation was apparent in this section. Good results were obtained with the Berkshire and Large White entries. The Tamworth crosses proved weakest in this measurement.

(iii) *Body Length.*—It is in this section that the entries fail to the greatest extent when compared to the ideal of the Smithfield system.

The best entries were Tamworth × Large White and Large White × Berkshire × Large White. Only 13 of the 37 entries succeeded in gaining 50 or more per cent. of the points in this section and it is worthy of note that 10 of the 13 referred to were Berkshire (6), or crosses with that breed. This is mentioned to indicate that while Berkshires are frequently criticised because of their lack of length, their actual performance was more consistent than the other breeds.

(iv) *Leg Length.*—Probably the greatest variation occurred in this section. Points allotted ranged from 20 to 100 per cent. of the maximum. The measurement of this feature, when considered with the weight of the carcass, has been shown to be an indication of the proportion of bone in the carcass. Little bone is desirable so that the proportion of edible parts may be greater. The best results were in the Berkshire and its crosses, which appeared to be far superior to the other breeds.

4. *Feeding.*

Competitors were asked to indicate the method of feeding as the quantity and kind of food supplied has considerable influence on the quality of the carcass.

The ideal bacon carcass has a high lean-meat-to-fat ratio, contained in a lengthy body with strong loins, full hams and light shoulders.

Bone and muscle or lean meat develops more rapidly than fat in the early stages of life, but as the pig approaches maturity, skeletal and muscle growth slow down and fat can be laid on more readily.

The best carcasses can only result when the pigs are fed adequate quantities of muscle and bone-building nutrients—that is a ration with a relatively high proportion of protein to carbohydrate, with the addition of minerals. The protein must also be of the right quality, regulated in West Australian conditions usually by including a proportion of skim milk or meat-meal.

Where early feeding is at too low a level, either in quantity or quality, the animal will reach maturity without having made satisfactory growth. Topping-off for market then results in weight gain, almost entirely from fat.

Carcasses from such pigs would probably score poor points on appraisal in respect of body length (short); back-fat (too much); eye muscle (not wide enough); shoulders (too fat); etc.

From the data provided by the competitors, it is apparent, as would be expected, that with few exceptions, the same feeds were used. Therefore the differences in the carcasses, where not due to breed and strain, are probably related to the use of the different components of the rations in varying proportions.

No comment can be made regarding the practice of individual competitors, nor of the feeding of any one entry, other than to suggest that too wide a nutritive ratio is probably responsible for some of the poorer quality carcasses. This is supported by at least one case, where on the data submitted, it is clearly shown that the proportion of protein used was less than half the necessary amount. The carcasses in this case were very poor indeed.

BETTER DAIRYING COMPETITION 1948-49.

M. CULLITY, SUPERINTENDENT DAIRYING.

FOR five years from 1931 to 1936 the Australian Dairy Council sponsored competitions under the above title. They facilitated the collection of data in the course of judging, which when assembled in a general summary provided a valuable survey of the level of dairy farming and of dairy farm practice.

The Pasture Improvement Committee of W.A., supported financially by the Australian Dairy Produce Board and the Rural Credits Division of the Commonwealth Bank, decided to revive this competition and offered substantial cash prizes in various zones.

The view of the Committee is that its function is to encourage better dairying practice and in particular greater production by improving pastures and by the adoption of efficient methods of utilising pasture including the conservation of surplus growth as hay and silage.

As previously, the Department of Agriculture supported the project fully and arranged judging by officers of the Dairy Branch.

No alteration was made in the boundaries of the Zones which were adopted previously, as these had been proved satisfactory, both for judges and competitors.

The map shows the location of the zones which were known as :—

Zone 1—Coastal.
Zone 2—Bunbury-Donnybrook.
Zone 3—Busselton-Margaret River.
Zone 4—Bridgetown.
Zone 5—Manjimup-Northcliffe
Zone 6—Great Southern.
Zone 7—South Coastal.

Cash prizes were offered in each zone as follows—

First	—	£20 and framed certificate.
Second	—	£12.
Third	—	£8.
Fourth	—	£6.

The following scale of points was adopted :

		points
1.	Conservation of Fodder and Summer Crops	300
2.	Pastures	240
3.	Dairy Herd	120
4.	Return of Butterfat, etc., per acre . .	120
5.	Pigs	30
6	Farm Management .	140
7.	Utilisation of Skim Milk	50
	Total	1,000

Where a competitor sold his product in liquid milk form, the scale of points was adjusted so as to place him on a relative basis with competitors who supplied cream to a butter factory.

To facilitate judging this scale was expanded to the form shown with the results for each zone. As a number of judges were being used steps were taken to ensure as great uniformity as possible in allotting points.

Judging was carried out between November 30 and February 28. However, as pastures on most farms would be dry at this period, all farms were inspected during the Spring to make an assessment of pastures.

The detailed schedules of points allotted each farm are given in Tables 1 to 6.

No entry was received from Zone 6, for which it was intended that the competition would be for fodder conservation only.

POINTS GAINED BY COMPETITORS IN ZONE 1—COASTAL.

	Max. Points	Rosher, E.	Bassett-Scarfe Bros.	Cunningham, A.	Webb, E. M.	Pethwick, W.	Montgomery, M.	Temple, L. M.	Pallthorpe, J.	Murray, J.	Lukin, J.	Williams Bros.	Zeecan
1. Conservation of Fodder and Summer Fodder Crops: 300 points.													
(a) Hay. Quality, Condition	40	35	35	35	35	35	30		35	32	30	30	30
(b) Baling	10		10	10					10				
(c) Silage. Quality, Type Wastage	25		10		20	22			20				
(d) Summer Fodder crops, cultivation Disease, Yield	25	25	20	20	20	20	25	25	10			10	15
(e) Amount conserved per cow	200	169	200	200	200	125	200	90	104	140	80	144	64
2. Pastures: 240 points.													
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	110	125	110	100	110	80	125	85	80	55	65	65
(b) Management, Fertilisation	100	65	65	65	65	75	60	85	55	55	55	50	50
3. Dairy Herd: 120 points.													
(a) Dairy Type	50	45	40	45	40	48	48	45	40	40	40	45	40
(b) Condition	20	20	18	20	20	20	20	20	18	18	20	15	18
(c) Freedom from Disease	20	18	18	18	18	18	18	18	18	18	18	15	18
(d) Herd Sire—(i) Pure-bred	20	19	17	17		18	20	19	18	18	18	15	6
(ii) Ex tested Dam	10	9	5	5			9	10		6	9	7	2
4. Returns Per Acre 120 points													
(a) Butter Fat lb per acre	100	100	72	27	36	44	23	34	58	33	62	10	23
*Sidelines £ per acre	20	2		1				18			1	1	
5. Pigs: 30 points.													
(a) Breed. Type and Condition	10											6	
(b) Number of Breeding Sows in proportion to Milch cows	10										..	.	..
(c) Housing. Feeding and Management	10											4	
6. Farm Management: 140 points.													
(a) Lay-out. Convenience, etc	50	40	30	35	40	35	35	45	35	35	42	25	40
(b) Sanitation—(i) General	30	25	20	25	25	25	25	28	25	20	25	15	25
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	40	25	35	30	35	38	40	25	35	35	15	35
(c) Book-keeping and Records	20	20	18	10	20	18	14	20	15	15	10	5	10
7. Utilisation of Skim Milk: 50 points. Based on number of pigs and calves fed	50											18	
Total	1,000	742	728	678	669	648	645	622	571	545	500	495	441
Adjusted—Supply of milk		807	791	737	727	705	701	676	621	592	544	495	479

*Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITION IN ZONE II.—BUNBURY-DONNYBROOK.

	Max. Points	Benson, R. C.	Bensted, & Co.	Frost, A. C.	Keall, E. D. C.	Crute, M. A.	Notron, J. P.	Fry M.C. & Sons	Edwards, P. P.
1. Conservation of Fodder and Summer Fodder Crops: 300 points.									
(a) Hay. Quality, Condition	40	35	30	35	30	22	35	35	30
(b) Baling	10	10	10	10			10	10	
(c) Silage. Quality, Type Wastage	25								
(d) Summer Fodder crops, cultivation Disease, Yield	25	20	15	20	18	20		15	25
(e) Amount conserved per cow ..	200	177	200	146	134	172	44	80	.
2. Pastures: 240 points.									
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	110	90	115	105	90	120	110	105
(b) Management, Fertilisation	100	80	75	80	70	60	80	75	70
3. Dairy Herd: 120 points.									
(a) Dairy Type	50	48	45	45	45	45	45	45	40
(b) Condition	20	20	20	18	18	15	20	20	18
(c) Freedom from Disease	20	18	18	18	18	15	18	18	18
(d) Herd Sire—(i) Pure-bred	20	18	19	19	18	18	17	16	18
(ii) Ex tested Dam	10	3	10	9	10	4	.	3	.
4. Returns Per Acre: 120 points.									
(a) Butter Fat .. lb per acre	100	50	14	32	24	12	36	24	45
*Sidelines £ per acre	20	1	4	7	14	5	20	4	
5. Pigs: 30 points.									
(a) Breed. Type and Condition	10	8	8	9	9	8	8	8	
(b) Number of Breeding Sows in proportion to Milch cows	10	10	5	1	10	8	5	2	.
(c) Housing. Feeding and Management	10	7	8	9	10	8	6	8	.
6. Farm Management: 140 points.									
(a) Lay-out. Convenience, etc.	50	45	45	45	40	40	35	35	35
(b) Sanitation—(i) General	30	25	25	25	25	25	20	25	25
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	38	35	35	40	35	25	25	35
(c) Book-keeping and Records	20	12	15	15	15	10	18	15	10
7. Utilisation of Skim Milk: 50 points. Based on number of pigs and calves fed	50	12	46	36	28	50	50	26	....
Total	1,000	747	737	729	681	662	612	599	474
Adjusted—Supply of milk								...	515

* Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITORS IN ZONE III.—BUSSELTON-MARGARET RIVER.

	Max. Points	Thompson, J.	Briggs, D. O.	Crookes, G. V.	Smith G. M. & Sons	Campbell, C. E.	Heath, C. N.	Butcher, W. N.
1. Conservation of Fodder and Summer Fodder Crops: 300 points.								
(a) Hay. Quality, Condition	40	38	35	35	35	30	35	30
(b) Baling	10		10	5	10	10		
(c) Silage. Quality, Type Wastage	25		18					
(d) Summer Fodder crops, cultivation Disease, Yield	25		20				15	
(e) Amount conserved per cow	200	200	200	200	200	110	100	95
2. Pastures: 240 points.								
(a) Density Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	135	115	122	120	118	105	110
(b) Management, Fertilisation	100	90	82	85	85	80	80	80
3. Dairy Herd: 120 points.								
(a) Dairy Type	50	48	45	50	45	40	40	40
(b) Condition	20	20	18	20	18	17	18	18
(c) Freedom from Disease	20	20	16	20	20	18	18	20
(d) Herd Sire—(i) Pure-bred	20	20	20	20	18	20		
(ii) Ex tested Dam	10	9	8	6	8			
4. Returns Per Acre. 120 points.								
(a) Butter Fat lb per acre	100	32	27	42	19	58	26	30
*Sidelines £ per acre	20	18	13	15	20	17	11	8
5. Pigs. 30 points								
(a) Breed Type and Condition	10	10	8	8	8	8	7	8
(b) Number of Breeding Sows in proportion to Milch cows	10	8	8	10	8	8	8	
(c) Housing, Feeding and Management	10	10	7	6	5	7	8	6
6. Farm Management: 140 points								
(a) Lay-out Convenience etc.	50	47	40	50	40	40	40	40
(b) Sanitation—(i) General	30	30	25	20	25	20	26	30
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	40	25	30	35	20	35	30
(c) Book-keeping and Records	20	18	16	15	20	15	15	20
7. Utilisation of Skim Milk: 50 points. Based on number of pigs and calves fed	50	50	36	32	36	42	28	24
Total	1,000	843	792	791	775	678	615	589
Adjusted—Supply of milk								

*Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITORS IN ZONE IV.—BRIDGETOWN.

	Max. Points	Maidment, S. C.	Dowrick, H. A.	Brennan, M.	Smith, F.	Daniels, H.	Moyes, H. S.	Williams, J. & M.	Ryan, K.	Richards, C.	Stapleton, E.	White, G.
1. Conservation of Fodder and Summer Fodder Crops: 300 points.												
(a) Hay. Quality, Condition	40	34	35	34	31	34	30	24	26		10	
(b) Baling	10	10	10	10	10		10	10	10			
(c) Silage. Quality, Type Wastage	25	25										
(d) Summer Fodder crops, cultivation Disease, Yield	25											
(e) Amount conserved per cow	200	88	200	144	160	120	106	68	112		64	
2. Pastures: 240 points.												
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	115	110	85	70	70	70	65	70	110	50	85
(b) Management, Fertilisation	100	100	74	60	60	62	50	56	50	65	40	65
3. Dairy Herd: 120 points.												
(a) Dairy Type	50	40	44	45	42	38	36	44	38	39	36	40
(b) Condition	20	18	18	19	18	18	17	17	16	19	16	18
(c) Freedom from Disease	20	15	18	19	18	18	17	18	17	16	15	19
(d) Herd Sire—(i) Pure-bred	20	18	20	18	20	18	15	19	17	17	20	19
(ii) Ex tested Dam	10	10	10	8	7	2	9	10				6
4. Returns Per Acre: 120 points.												
(a) Butter Fat .. lb per acre	100	26	22	55	16	24	23	12	33	40	8	39
*Sidelines £ ... per acre	20	15	0.5	2	11	4	20	13	.5	12	10	0.5
5. Pigs: 30 points.												
(a) Breed. Type and Condition	10	8				7	7	9		6	7	
(b) Number of Breeding Sows in proportion to Milch cows	10	7				5	10	8		2	8	
(c) Housing. Feeding and Management	10	7			4	4	7	7		7	4	
6. Farm Management: 140 points.												
(a) Lay-out. Convenience, etc.	50	40	40	37	30	32	35	42	35	39	35	37
(b) Sanitation—(i) General	30	28	28	27	28	28	20	29	25	28	20	22
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	35	35	32	32	32	28	35	32	37	28	30
(c) Book-keeping and Records	20	20	20	16	15	15	15	17	15	14	17	15
7. Utilisation of Skim Milk: 50 points. Based on number of pigs and calves fed	50	35	6	8	31	24	50	36	11	45	50	10
Total	1,000	69	690	619	603	595	575	539	507.5	496	438	405.5
Adjusted—Supply of milk												

*Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITORS IN ZONE V.—MANJIMUP-NORTHCLIFFE.

	Max. Points	Bashford, J.	Angel, A. J. S.	Dorrel, R.	Beard, W.
1. Conservation of Fodder and Summer Fodder Crops: 300 points.					
(a) Hay. Quality, Condition	40	36	35	30	35
(b) Baling	10			10	
(c) Silage. Quality, Type Wastage	25	18	17		.
(d) Summer Fodder crops, Cultivation Disease, Yield	25		1		
(e) Amount conserved per cow	200	200	200	125	91
2. Pastures: 240 points.					
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	120	73	100	100
(b) Management, Fertilsation	100	90	59	80	85
3. Dairy Herd: 120 points.					
(a) Dairy Type	50	45	50	50	50
(b) Condition	20	20	20	20	20
(c) Freedom from Disease	20	20	20	20	20
(d) Herd Sire—(i) Pure-bred	20	20	20	20	20
(ii) Ex tested Dam	U 10	2	9	6	7
4. Returns Per Acre: 120 points.					
(a) Butter Fat lb per acre	100	46	26	42	54
*Sidelines £ per acre	20	15	15	10	10
5. Pigs: 30 points.					
(a) Breed. Type and Condition	10	10	9	8	8
(b) Number of Breeding Sows in proportion to Milch cows	10	8	2	8	
(c) Housing. Feeding and Management	10	9	9		9
6. Farm Management: 140 points.					
(a) Lay-out. Convenience, etc.	50	45	30	50	50
(b) Sanitation—(i) General	30	27	25	30	30
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	37	35	40	40
(c) Book-keeping and Records	20	20	15	20	19
7. Utilisation of Skim Milk: 50 points Based on number of pigs and calves fed	50	46	45	17	18
Total Adjusted—Supply of milk	1,000	834	715	686	666

*Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITORS IN ZONE VII.—SOUTH COASTAL.

	Max Points	Bradford, W. L.	Pease, F.	Frost, W	Tysoe, L.	Burkitt & Brown	Beaney, W. A.	Smith, W. J.	Jordan, L.	Wilde, W.	Killick, E.	Wilkinson, R.
1. Conservation of Fodder and Summer Fodder Crops: 300 points.												
(a) Hay. Quality, Condition	40	35	32	32	30	35	35	32	32		30	36
(b) Baling	10	10		10	10	10	10				10	10
(c) Silage. Quality, Type Wastage	25	21	22		20							
(d) Summer Fodder crops. Cultivation, Disease, Yield	25		21									15
(e) Amount conserved per cow	200	199	168	200	165	88	88	52	82		64	90
2. Pastures: 240 points.												
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	120	120	105	100	118	117	130	115	130	90	100
(b) Management, Fertilisation	100	90	95	90	90	90	91	95	90	96	80	75
3. Dairy Herd: 120 points.												
(a) Dairy Type	50	47	40	45	30	48	46	50	46	38	41	40
(b) Condition	20	18	18	18	17	19	18	20	18	18	15	17
(c) Freedom from Disease	20	16	15	18	16	17	17	20	17	17	15	17
(d) Herd Sire— (i) Pure-bred	20	20	20	20	20	20	20	20	20	20	20	
(ii) Ex tested Dam	10	8	8	9	8	8	6	9	6	2	7	
4. Returns Per Acre: 120 points.												
(a) Butter Fat lb per acre	100	39	43	11	23	33	34	62	36	68	16	15
*Sidelines £ per acre	20	20	18	17	15	18	13	10	16	14	10	10
5. Pigs: 30 points.												
(a) Breed. Type and Condition	10	8	8	8	8	8	8	7		8	5	7
(b) Number of Breeding Sows in proportion to Milch cows	10	8	8	8	10	2	10			8		8
(c) Housing. Feeding and Management	10	7	7	8	7	7	7	7	6	7	6	7
6. Farm Management: 140 points.												
(a) Lay-out. Convenience, etc.	50	25	30	45	42	48	40	40	40	42	45	20
(b) Sanitation— (i) General	30	15	20	25	25	30	24	20	22	26	26	10
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	25	20	32	30	40	32	35	30	34	35	10
(c) Book-keeping and Records	20	15	15	16	18	18	16	15	15	14	16	5
7. Utilisation of Skim Milk: 50 points. Based on number of pigs and calves fed	50	50	24	30	38	26	30	28	25	22	26	41
Total		796	752	747	722	683	662	652	616	564	557	533
Adjusted—Supply of milk	1,000											

*Pigs, Poultry, Vegetables, etc.

DISCUSSION ON ASPECTS OF MANAGEMENT.

As indicated earlier, the Better Dairying Competitions in other years has provided material which permitted some appreciation to be made of the level of dairy farming in this State. While it is admitted that the general average of the competitor's farms are probably above the average for all dairy farms, it is believed that there is some justification for accepting and using the data as an indication of a reasonable level of efficiency and for portraying trends in farm husbandry. In the following notes, therefore, various phases of farm management will be discussed in relation to common measures of production or of farm practice. Further, it is appropriate that some comment be made indicating what is considered good practice so that the results may be viewed in proper perspective.

CONSERVATION OF FODDER.

A. General.

As the title of the Committee would suggest, its primary function is to assist in the improvement of pastures, but it has viewed its responsibility broadly, having in mind the reasons for its establishment, viz., to assist the farmer to obtain greater output from his property, thus giving greater economic stability and also to encourage the creation of greater national wealth by promoting increased production from the industry. In this competition therefore it has endeavoured to stimulate interest in efficient dairy farming. While at the same time emphasising the important place of pastures it realises that the feed given to the cow is the raw material from which milk is made, while the cow herself and other features of the farm provide the machinery and organisation. The importance of feed has been stressed by providing that the items in the scale of points relating to pastures, cropping and conservation together command 52 per cent. of the total maximum points.

A dense crop of meadow hay. G. V. Crooke, Cowaramup.

As climatic conditions in Western Australia do not permit, except in special localities, of a perennial type of pasture which would provide green grazing though the greater part of the year, but restrict pastures to an annual type giving from 6 to 8 months grazing according to district and season, management must provide supplementary feeding during the 4 to 6 months when no green pasture is available.

In addition, fodder is needed at other periods to supplement pasture growth. In an adequately fed herd maintained in production throughout the year, or in which each cow has a lactation period of nine or ten months, feeding of hay or silage is needed, commencing in November or December as the pastures approach maturity. This feeding should then continue at least into the early summer months with the possible addition of summer growing fodder crops. Where the majority of the herd has calved, in the early autumn, the amount of feed needed for milk production in the late summer will not be great, but for high yields it is essential that feeding of the cows approaching calving be continued on a high level as provision has to be made not only for maintaining the cows, but also to develop the calf and to build the primary tissues of the udder without which good milk flow is not possible.

At the break of the season, full supplementary feeding from reserves or fodder crops is equally as important, as at this period the amount of paddock feed is at its lowest. This improves in most districts till about the end of June in a normal season. From then till the end of July, or August in the more southerly districts, growth of pastures slows down owing to the cold and near waterlogged condition of many soils. Consequently the use of reserves is necessary till at least the beginning of August.

During these periods bulls, horses and young stock have to be maintained also and with the later there must be a margin for growth. The quantity needed for these purposes has been calculated as the equivalent of 2½ tons of hay per cow. This supplies an adequate margin for the feeding of other stock usually found on a dairy farm. This quantity therefore has been used as the amount which would be needed by competitors to gain maximum points. Where silage or fodder crops were used, the total quantity of each was converted to an equivalent of hay. In cases where substantial areas of irrigated or other natural summer growing pastures were used, the total requirement for reserves would not be so great, and therefore the goal set for maximum points was reduced according to a predetermined scale.

B. Total Quantity Conserved.

The average amount of reserves of hay and silage and summer feed was :—

1.20 tons of hay
0.28 tons of silage
0–62 tons of green fodder.

This is equivalent to 1.52 tons of hay (three tons of silage or fodder being considered the equivalent of one ton of hay). There is a considerable reduction in the quantity of hay conserved per cow compared to earlier competitions, although there was a steady decline from 1932 to 1946. This will be seen in a study of the figures in Table 7. This is disappointing but the effect is offset to a degree by the fact that a considerable amount is now stored in bales allowing more efficient use and less wastage in handling and feeding.

It will be noted also that there has been a steady decline in the amount of silage which has been made.

TABLE 7.

Zones.	Total Cows	Hay	Silage	Green Fodder	Reserve per Cow Hay	Reserve per Cow Silage	Reserve per Cow Green Fodder	Reserve Per Cow Calculated as Hay
1. Coastal—	608	822	347	767	1 35	0 57	1.26	1 96
E. Rosher	65	75		120	1.15		0 34	1 50
2. Bunbury-Donnybrook	269	308		272	1.12		1 00	1.45
R. C. Benson	31	42		16	1.35		0 51	1.48
3. Busselton-Margaret River	230	321	35	256	1 39	0 15	1.1	1 7
J. Thompson	39	60			1.54			1 54
4. Bridgetown	400	361.5	12		0 90	0 03		0 91
S. C. Maidment	73	61.5	12		0 84	0 16		0 88
5. Manjimup-Northcliffe	161	199	82	6	1 10	0 41	0 03	1 28
J. Bashford	36	58	20		1 61	0 55		1.75
7. South Coastal	286	340	81 5	78	1 18	0 28	0 27	1 33
W. L. Bradford	18	38	27 5		2 11	1 53		1 94
All Zones 1948-9	1,964	2321 5	597	1,379	1 20	0 28	0 70	1 55
1935-6	2,109	2,711	1,169		1 30	0.55		1 47
1934-5	1,550	2,232	1,307	264	1 43	0 84		1 77
1933-4	1,633	2,447	1,432		1 49	0 89		1 83
1932 3	1,531	1,854	1,784		1.21	1 16		1.64
1931-2	1,502	1,605	931		1 06	1 71		1 33

The total reserves in all Zones except Coastal were lower than in previous years and in no case was the Zone average two tons per cow. The highest was in the Coastal Zone where 1.96 tons per cow were conserved. The lowest was Bridgetown with only 0.91 tons. What may be surprising in these circumstances will be seen later in the relatively high yield per cow, but it must be remembered that the latter figures are for the season prior to judging, while fodder reserves which were measured were for future use.

Of the individual farms it is pleasing to record that there were several on which maximum points were awarded because there were 2¾ tons or more conserved for each cow on the properties, or a proportionately lower quantity where good summer pasture was available. These were as under :—

Zone 1—

Bassett Scarfe Bros.	Keysbrook
Cunningham, A.	Byford
Webb, E. M. ..	Cookernup
Montgomery, M.	Armadale

Zone 2—

Bensted & Co.	Dardanup

Zone 3—

Thompson, J.*	Bramley
Briggs, D. O.	Metricup
Crooke, G. V.* . .	Cowaramup
Smith, G. M. & Sons*	Jindong

Zone 4—

Dowrick, H. A. .. .	Mullalyup

Zone 5—

Bashford, J.*	Northcliffe
Angel, A. J. S.	Jardee

Zone 7—

Frost, W.	Kendenup

* Quantity for maximum points reduced owing to availability of summer pasture.

It is possible that labour shortage has contributed to the lesser amounts which have been conserved. If so it can be suggested that farmers make arrangements early for assistance or for the use of equipment from contractors which would reduce the calls on the time of those who are responsible for routine farm operations.

It is probable that the advocacy of early calving, that is, between March and July of each year, has contributed to the decline in the provision of silage, as some farmers believe that early calving will enable them to dry off their cows in the early summer and therefore silage would be of no value. If this is so, there are several fallacies in the thought. Reports of Grade Herd Recording show—(a) approximately 25 per cent. of the cows calve outside the optimum period;

(b) the average length of lactation in all units is too short;

(c) the proportion of cows completing a 273-day lactation in all units is small.

Therefore it is obvious that on the great majority of farms summer feeding is still necessary despite the endeavour to arrange early calving for the herd.

C. Hay.

The quantity of hay made for each cow was higher than in the first competition but lower than in the more recent ones. This probably is due to the change in farming routine which was forced on the farmers during the war owing to the lesser pasture

Loading clover hay. Margaret River.

growth following reduced topdressing rates, and to the shortage of labour for harvesting. The former aspect has since been rectified and the labour position is also better. There appears a tendency, however, on some farms to limit operations to what can be handled by the farmer himself. Despite the cost of additional help, either of manual or mechanical type, at the present higher rates, hay is still cheaper than any purchased feed. Hay cutting takes place at a period of the year when cash returns for produce sold are buoyant and few farmers cannot find the money to pay for the extra assistance.

Adequate quantities of hay can be obtained however only when planning for conservation is well ahead of the harvest period. Stocking must be adjusted to provide a sufficient surplus for cutting both as silage and hay. This involves care not to overstock the property, so that a sufficient number of paddocks can be closed early in the spring.

The trend to baling is pleasing from two aspects --firstly, it permits more efficient storage and use, that is less wastage, and, secondly, it indicates that mechanisation of harvesting is increasing.

The greatest quantity of hay per cow was conserved in Zone 3—Busselton-Margaret River where 1.39 tons were available. Comments by the judges on the quality of the hay were pleasing. Generally, cutting had been at the correct stage and the curing was good, nice colour and aroma being preserved. However, some cases were noted where cutting had been delayed and also where spoilage by rain or bad handling had occurred.

D. Silage.

Silage has the advantage of being succulent and palatable, but equally important, silage making can commence and end before the hay cutting season, thus enabling the one team of men to cut and conserve the growth from more acres. As the pastures are cut earlier than for hay, silage contains more protein which is specially valuable in the summer months when paddock feed normally is innutritious and unsuitable for maintaining milk yields. Silage can be made in all weathers, as rain will do no harm.

The provision of more modern harvesting and stacking equipment may eventually make the task of silage making practicable on a larger number of farms.

E. Green Fodder Crops.

On examination of Table 7 will show that the total quantity of green summer fodder crops provided was no greater than in any previous competition. This is not surprising in view of the labour requirements for cutting and feeding, and also the apparent growing objection to hand feeding of all kinds.

There has been little change in the position in any Zones other than a disappointing decline in Zones 4 and 5. The former has never been prominent for attention to this phase of dairying, while the latter has greater opportunities which are not being accepted.

The greatest quantity was provided in Zone 1 where 767 tons of green fodder were estimated to have been grown. These districts are those supplying milk to the metropolitan area and therefore there is greater need for keeping cows in milk during the summer.

TABLE 8.
ACREAGE OF GREEN FODDER PER COW.

Zone	No. of Cows.	Summer Fodder Acres.	Acres Sown per Cow.
1. Coastal	608	116·5	0·19
2. Bunbury-Donnybrook	269	44·25	0·16
3. Busselton-Margaret River ..	230	30·50	0·13
4. Bridgetown	400	..	...
5. Manjimup-Northcliffe	161	1·0	...
7. South Coastal . .	286	7·0	0·02
Total .	1,964	198·5	0·10

There is ample scope for more attention to the growing of these crops, and it is certain from past experience that they can be grown satisfactorily when agricultural principles are complied with. Late ploughing and seeding cannot be expected to give good crops except in specially favourable localities, but early ploughing and cultivation, adequate fertilisation and sowing at the right time according to moisture conditions, have been proved to give profitable crops even in what is not considered summer land.

An estimate of the acreage of green fodder which is necessary to feed a cow in milk during the summer months may be made as follows :—

A normal daily ration of 40 lb. of green fodder would absorb approximately three tons in five months. An average yield of green crop satisfactorily grown is 10

A maize crop. Elgin, 1949. B. Vollrodt.

tons per acre. Thus approximately 0.3 acre per cow would be required. For ease of memory this may be translated to ¼ acre per cow. Where silage is provided the need for this quantity of green crop would be reduced.

The actual acreages sown in each Zone are given in Table 8 and it will be seen that in no case has the area sown approached the maximum requirements as estimated above. An examination of silage production does not suggest that silage plus green crops were sufficient in any Zone. It is estimated that three tons of silage per cow would be required to supply a normal ration to a cow during the five months December to May. If 1½ tons of silage and ¼ acre of green crop were provided it would have the same result. Table 7 shows in only Zone 1 was there more than ½ ton of silage per cow. Consequently the total provision of succulent feed of both forms was inadequate and this no doubt contributes largely to the short lactations and low yields to which attention is drawn in reports on Grade Herd Recording.

The acreage of various kinds of fodder crop grown is given in Table 9.

TABLE 9.

KINDS AND ACRES OF GREEN CROPS.

—	Zone						Total
	1	2	3	4	5	7	
Sacchaline	60	..					60
Maize ...	20	5¼	13¾			4	43
Melons	14	4					18
Swedes			10				10
Lucerne	8	8					16
Millet ..	9	16	4		1		30
Elephant Grass	1½					..	1½
Sudan Grass	4	11	¾			3	18¾

Reference has been made previously to the reluctance of farmers to undertake summer cropping because of the labour involved, therefore some emphasis must be placed on the summer crops which can be grazed and which therefore once planted do not require more attention than pasture, other than a careful control of grazing. Crops which may be treated in this way are Sacchaline, Millet and Sudan Grass. Lucerne also can be grazed but this crop is too valuable to be used, other than very lightly, in this way.

Attention must also be drawn to the value of lucerne as a crop which supplies not only succulence but much protein of a very high quality for milk production. The difficulty of establishment, caused almost entirely by the ravages of lucerne flea and red mite has prevented many farmers from giving this crop the attention it merits. It is hoped that methods will be found of controlling these pests during the establishment period.

In the irrigation areas or where farm irrigation systems are available, spring planting is safe and gives relative security from insect attack. The protein value of this crop, and others such as cow peas, is such that it is ideal where summer milking is necessary and that is the case on every farm for at least a portion of the herd if good yields are expected. Protein is the most expensive of the essential food elements to buy. Fortunately in Western Australia clover hay and silage provide useful sources but these can be supplemented ideally by a protein rich fodder crop.

PASTURES.

A. *General.*

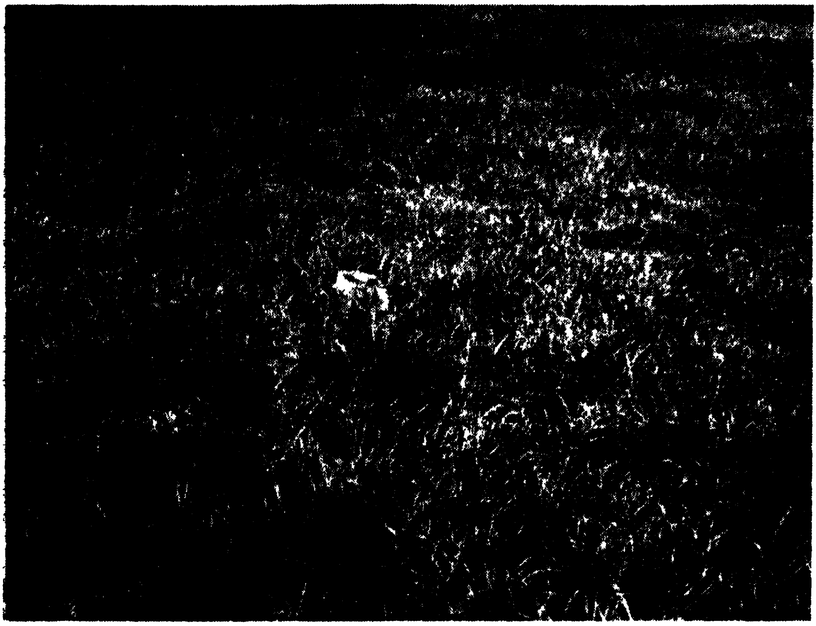
The Judges referred to pastures generally as being very good. In the Coastal Zone there were appreciable areas irrigated and in the Busselton-Augusta Zone summer moist conditions on several of the farms permitted perennial species to grow vigorously. In these cases the Judge stated that at the end of February these paddocks were quite vigorous.

The Judge in Zone 4, Mr. K. W. Simes, reported that there is a feeling among all farmers that pastures will need further great improvement if production is to be improved to any extent. Liberal applications of fertiliser were used and found successful in stimulating a greater bulk of feed. Only one competitor in this Zone applied less than one bag per acre; the highest rate was 250 lb. This practice is in line with the recent results of experiments at the Wokalup Research Station where two cwts., per acre proved the most economical application.

The incidence of insect damage apparently was not great. No reference was made to any progressive endeavour by farmers to include higher yielding and more nutritious grass species in their clover paddocks although comment was made on the value of phalaris tuberosa and kikuyu grass perennial rye grass has been shown to to be of special value on the more southerly districts while good results from Wimmera rye are being obtained in all districts.

A good phalaris tuberosa subterranean clover pasture. Mrs. M. C. Fry and Sons, Donnybrook.

In view of the stated interest of farmers in the improvement of pastures it is disappointing that no record of efforts to improve the swards has been made. It is probable that the ease of establishment and maintenance of subterranean clover has contributed to a state of mind which does not acknowledge the need for reseeding of other species when they tend to disappear. Experience has shown that reseeding on occasion will result in the gradual building up of strains which will survive. The prolonged dry summer period tends to make the finding of several perennial species for pastures most difficult but phalaris tuberosa and kikuyu will survive in all dairying districts. Clunes strain of perennial rye grass appears to have a lower summer death rate than other strains, but severe reduction in stands will occur other than in selected moist situations of most farms. In the Margaret River, Northcliffe, and South Coastal districts it has little difficulty in surviving.



Perennial ryegrass with sprinkling of white clover. Peat swamp, Pardalup.

Little attention has been given in the past to the finding of an annual species which will grow in association with subterranean clover. Wimmera rye grass is suitable and merits greater use.

Subterranean clover sown on scarified sandy surface. Pardalup.

In the irrigation districts paspalum is the most aggressive species and most farmers knowing its tendency to invade, sow perennial rye grass and phalaris tuberosa with the expectation that these plants will assist in keeping the ultimate paspalum sward reasonably open. White clover is used universally as the legume balance.

No Judge made reference to the systematic harrowing of any pasture nor was there evidence of adequate control of grazing. The light cultivation or harrowing of pastures at the commencement of the season is recommended as also is the practice of chain harrowing after grazing to break up droppings.

Cow droppings—Chain harrowing to break droppings should be a part of routine pasture management.

The use of copper fertilisers is almost universal in the Busselton-Augusta Zone while many farmers in the Bridgetown-Manjimup and Denmark districts have also adopted the use of this fertiliser.

There was a pronounced increase in the average area used for dairying on each farm. The improvement was from 118.6 acres in 1934–5 to 144.1 acres in 1935–6 to 163.5 acres on the current competition. Therewas a corresponding increase in the herd size, the figures for the same three years being 27.7, 33.5, and 37.0 respectively (see Table 10).

B. *Carrying Capacity.*

Probably the best measure of the value of, a pasture is the quantity of produce which is marketed from it. This is controlled by the level of management both in respect to the system of grazing, cultural treatment and fodder conservation. In fact all aspects of farm management will contribute to the level of yield but it can be expected that high production is impossible from poor pasture.

There are two methods of assessing the usage of pasture adopted in this competition, the stocking concentration and the yield per acre. The average stocking concentration expressed as acres utilised per dairy cow (or cow unit), is given in Table 10.

TABLE 10.

ACRES UTILISED PER MILCH COW.

	Average Number of Cows in Herd				Acres devoted to Dairying				Acres per Cow.			
	1948–49	1935–36	1934–35	1933–34	1948–49	1935–36	1934–35	1933–34	1948–49	1935–36	1934–35	1933–34
Zone 1	51	36·0	41·0	35·7	211·8	172·0	89·0	123·8	4·1	4 7	4·46	3·6
Zone 2	34	56·4	29·5	36·0	140·1	213·0	117·6	244·7	4·1	3·8	3·80	6·8
Zone 3	33	22·1	23·1	21·3	145·6	100 3	93·5	91·0	4·3	4·5	4·00	5·8
Zone 4	36	32·0	21·9	25·6	194·2	154·0	125·0	134·4	5·3	4·8	5·40	5·3
Zone 5	43	23·9	21·5	21·8	125·2	86·3	77·4	85·3	3·1	3·6	3·60	4·2
Zone 7	26	.	20·2	18·5	122·0		89·2	55·0	4·7	.	4·40	3·0
Average	37	33·5	27·7	26·3	163·5	144·1	118·6	126·7	4·4	4 3	4·14	4·7

It will be seen that there was no appreciable movement in the concentration of stocking since 1936. The result this year after a lapse of 13 years confirms the conclusion drawn from the previous competition that approximately 4½ acres were required per cow-unit under average conditions. It is interesting that this figure has again been obtained while there has been a change in the size of the average herd and acreage used for dairying among the entrants. In 1935–6 the average herd was 33.5 cows while in the present competition it has risen to 37 cows. This has been due partly to the inclusion of some large herds in Zone 1. The average acreage increased correspondingly from 144.1 to 163.5 acres.

There was a fall in the size of herds in Zone 2 from 1935-6, but an unusually high average was recorded for that year owing to the entry of a few large farms.

In Zone 3 the size of the herds is higher than ever before recorded. This is in line with the gradual development of more pasture and the rejuvenation of large areas following the use of copper fertilisers.

A similar trend is noticeable for Zones 4, 5, and 7 and suggest a movement to greater stability.

Zone 5 had the heaviest carrying capacity and the second highest output of butterfat per acre.

As indicated in reports for other years, it was decided to adopt a basis of acres per cow-unit as the measure of carrying capacity as likely to be more reliable than estimates of acres per head of stock and more simple than would be involved in attempting to translate carrying capacity to the equivalent of large stock. This latter method is useful but not so easily understood by all interested.

On a farm devoted to dairying, in addition to milch cows there will be a number of heifers—in calf—yearlings and calves—plus bulls and horses. These all have to be fed and so should be considered auxiliary to the cows. Most farmers rear their own replacement stock and therefore apart from variations in the incidence of

disease the proportion of young stock to cows should be relatively constant from farm to farm. In the estimate used in previous reports it was suggested a 20-cow farm or 20-cow unit would contain 50 head as under.

Stock on farm supporting 20 cows.

20	cows
9	Heifers 2 year old.
9	Heifers yearlings.
9	Heifers calves.
1	Bull.
2	Horses.
50	

Data collected by Judges has shown that this basis is a little more liberal than is the case on the farms under review.

The composite figures for all farms were :—

Cows	1,964
Heifers	706
Calves	1,046
Bulls	80
Horses	100*
	3,896

* Not recorded. Estimate only.

It follows from the above that while the carrying capacity in terms of cow units was 4.4 acres. It was equivalent to 2.2 acres per head of all classes of stock. In terms of equivalent of large stock it is estimated to be 3 1 acres. This confirms the usual assessment of the value of average dairying land and justifies confidence in the relative accuracy of the data collected.

DAIRY HERDS AND PRODUCTION.

This section was intended to give some idea of dairy type and the condition of the herds, but it appears little value can be expected from a simple allocation of points on inspection, particularly where more than one judge is operating. Further, the impossibility of deciding the value of a cow, or a herd on inspection while ignoring the influence of feed and management on the appearance of the animals, emphasises the desirability of adopting an amended system which will be a measure of the cows, capacity under the existing system of management.

The Judges' assessments of quality in all zones were high; in fact, it appears that there was too liberal treatment of most herds. This, however, does not discount their considered opinion that the herds were of merit. No data were collected regarding breed other than so far as the breed of the herd sire would indicate the breed of the herd. This was the case on nearly all farms.

In discussing the herds therefore one can only consider their actual yields during the period of the competition. These can be considered first on the basis of the actual performances of the herds per cow and then their effectiveness in giving larger output per acre.

A high yielding Jersey herd. G. V. Crooke, Cowaramup.

A. *Production Per Cow.*

The average yield was higher than in any previous competition as indicated by Table 11.

TABLE 11.

AVERAGE YIELD PER COW.

Year	Number of Cows	Average yield per cow Butter-fat.
1948–49	1,964	232·9
1935–36	2,109	212·0
1934–35	1,550	192·7
1933–34	1,663	208·8
1932–33	1,531	201·5

This result is particularly pleasing as it can be interpreted as meaning a rise in average herd quality and a corresponding lift in the level of management.

The results in the individual zones, together with information regarding the highest producing herd in each zone is given in Table 12.

TABLE 12.

AVERAGE PRODUCTION PER COW IN EACH ZONE TOGETHER WITH THAT OF THE HIGHEST PRODUCING HERD.

Zone	Number of Cows	Average in Herd	Average Butterfat per Cow	1935–36
1. Coastal	608	51	270	233·4
Bassett-Scarfe	...	104	376	
2. Bunbury-Donnybrook	269	34	203·8	205·0
R. C. Benson	....	31	250	
3. Busselton-Margaret River	230	33	235·8	260·0
G. V. Crooke	...	21	390	
4. Bridgetown	400	36	220·8	229·1
M. Brennan	...	30	287	
5. Manjimup-Northcliffe	161	43	214·3	179·6
R. Dorrell	..	40	244	
7. South Coastal	286	26	214·4	
W. J. Smith	...	23	343	
Average all zones	1,964	37	232·9	212·0

The best performance was that of Mr. G. V. Crooke of Cowaramup whose herd of 21 high grade Jerseys gave an average of 390 lb. Another very good result was that of Messrs. Bassett-Scarfe's mixed herd which gave a yield of 376 lb. This is a particularly meritorious performance because of the large size of the herd which comprised 104 cows. Both herds were very well fed, the former having access to more than one acre per cow of summer pasture, and the latter over an extensive area of Sacchaline. Plenty of hay was also available while 150 tons of silage was provided on Messrs. Bassett-Scarfe's property.

Mr. Crooke's herd is of high quality Jerseys and was in excellent condition. The herd has been under test for some years. Mr. Crooke follows carefully the policy of having his cows calve early. Only four were in milk in March, 1948 ; 12 in April and 19 in May. The other two cows calved in June and July, and the 21 were still in milk in December last and were to be kept in production in the following months. Thus Mr. Crooke has the ideal method for achieving high yields. That is—good cows, good pasture, plenty of conserved fodder and good management, including early calving. The produce as sold is cream for buttermaking.

Messrs. Bassett-Scarfe's herd is used for milk production for the metropolitan area and is maintained in milk throughout the year. Feeding is heavy with good pastures as a base, supplemented with ample hay, silage, green crops and concentrates.

Mr. W. J. Smith's herd of pure bred Guernseys in the Denmark district also gives very high yields. The 23 cows averaged 343 lbs. Excellent pastures are available while approximately one acre of summer growth per cow assists in maintaining summer flow. All cows are machine stripped, and are remarkably free of all disease. Individual animals in this herd have produced over 600 lb fat, while a junior two year old heifer under official test made a record of 510 lb during the past year.

The heifer becomes the cow. Heifers intended for the War Service Land Settlement Scheme.

Other performances worthy of note are set out in Table 13, which gives details regarding the herds which averaged over 250 lbs.

TABLE 13.

HERDS PRODUCING MORE THAN 250 LBS BUTTERFAT PER COW—1948-49

Owner.	Zone	Number of Cows in Herd	Production of Butterfat per Cow
Crooke, G. V.	3	21	390
Bassett-Scarfe	1	104	376
Smith, W. J.	7	23	342
Lukin	1	38	335
Murray	1	24	325
Cunningham	1	45	308
Pethwick	1	50	305
Campbell, C. E.	3	30	293
Brennan, M.	4	30	287·3
Montgomery	1	25	285
Dowrick, H. A.	4	30	268·7
Wilde, W.	7	28	265
Richards, C.	4	34	264·5
Thompson, J.	3	39	259
Bosher, E.	1	65	257
Benson, R. C.	2	31	250

It is interesting that of the seven herds producing more than 300 lbs fat per cow, five were in Zone 1 and supply whole milk to the metropolitan area.

As these latter competitors are interested in cow yields measured in gallons, rather than in pounds of butterfat, and also as the measurement of the performances

of their herds was in gallons, and later converted into pounds of butterfat, the following details of average milk yields in Zone 1 will be of value. The data in Table 14 shows that high average yields can and are being obtained in the milk zone. The results are a credit to the farmers concerned, and are proof of the high degree of efficiency with which their herds and their properties are being managed.

TABLE 14.

HERDS' SUPPLY WHOLE MILK, ZONE 1—AVERAGE YIELD OF MILK PER COW.

Name	Cows	Total Yield	Average Yield
E. Rosher	65	41,190	633
B. Scarfo	104	96,382	927
A. Cunningham	45	33,541	745
E. M. Webb	27	13,290	492
Montgomery	25	17,215	688
W. Pethwick	50	37,893	758
C. Zeccan	65	31,888	490
J. Pailthorpe	70	36,957	528
J. Murray	24	18,865	786
Lukin	38	31,664	835
	513	358,885	700

A comparison of average milk yields in Zone 1 for various years is also given in Table 15, and shows an upward trend.

TABLE 15.

COASTAL—ZONE 1

Year	Average Yield
	Gallons
1948–49	675
1935–36	583*
1934–35	540*
1933–34	552*
1932–33	414*

*Converted from butterfat averages, as published for earlier competitions, to a 4% milk.

B. *Production Per Acre.*

On any farm the movement in the yield per acre is in direct proportion to the movement in total output from the property unless more acres are being brought into use. While the per acre results are no indication of the economic stability of a farm they can be used in comparing the efficiency of management of properties of about equal size operated under similar conditions.

Some details are given in Table 16 showing the yields in the various Zones compared to the leading farm in each. It will be seen that the average of 52·6 lb. is slightly higher than in 1935–36. The improvement however is not consistent in all zones.

TABLE 16.

AVERAGE PRODUCTION OF BUTTERFAT PER ACRE COMPARED WITH THAT OF THE LEADING FARM IN THIS RESPECT.

Zone	Acres used for dairying each farm	Cows Average Number each farm.	Butterfat Produced per Acre					
			1948–9	1935–6	1934–5	1933–4	1932–3	1931–2
1. Coastal ..	211·8	51	64·5	48·9	47·0	61·6	34·8	53·4
E. Rosher			172·0	.				....
2. Bunbury - Donnybrook	140·1	34	49·0	54·1	57 7	32·8	46·6	50·4
R. Benson .			86·1					....
3. Busselton-Margaret River	145·6	33	53·2	57·3	54·9	46·6	43·6	37·9
C. E. Campbell			99·0	..	.			.
Bridgetown	194 2	36	41·6	56·0	42·9	35·7	40·7	35·1
M. Brennan		.	93·7					
5. Manjimup - Northcliffe	125·2	43	66·3	49·7	49·0	46·0	38·8	35·5
W. Beard			92·3	...			.	.
7. South Coastal	122·0	26	45·7		58·1	70·0	49·4	45·4
W. Wilde		..	117·0			.		....
Average All Zones ...	163·5	37	52·6	50·3	48·6	43·8	42·6	43.0

Earlier comments drew attention to an increase in the areas used for dairying. This combined with a maintained acre output means considerably higher farm outputs.

The highest result was obtained in Zone 5 where a figure of 66·3 lbs. was recorded. The winning entrant, Mr. J. Bashford, produced 79 lbs. fat per acre. Mr. W. Beard, however, was the more successful in this section as the yield from his property was calculated as 92·3 lbs. per acre.

Zone 1 had the next highest average 64·5 lbs. In this district nearly all entrants are producers of whole milk and their figures in gallons were converted to butterfat on a four per cent. basis. The leading farm, that of E. Rosher, gave the excellent return of 172 lbs. of fat, or 430 gallons per acre. Mr. Rosher purchases a considerable amount of fodder for his stock; this is necessary as his herd of 65 cows has only 95 acres of grazing. The performance is most meritorious and it proves a high level of farm and herd husbandry.

The following list contains the names of those whose yields were above average:—

E. Rosher, Bassendean	172 lbs.
Bassett-Scarfe Bros., Keysbrook	123 lbs.
W. Wilde, Hazelwood	117 lbs.
J. Lukin	107 lbs.
W. J. Smith, Denmark	105 lbs.
C. E. Campbell	99 lbs.
M. Brennan, Balingup	93·7 lbs.
W. Beard, Manjimup	92·3 lbs.
R. Benson, Upper Capel	86·1 lbs.
P. Edwards, Waterloo	77 lbs.
F. Pease, Torbay	73 lbs.
R. Dorrell, Manjimup	72 lbs.
G. V. Crooke, Cowaramup	72 lbs.
C. Richards, Warner Glen	69·1 lbs.
J. Thompson, Bramley	69 lbs.
W. Bradford, Denmark	67 lbs.

As more suppliers of whole milk are represented in the present competition it is of interest to record the average yield of milk per acre. This is 161 gallons per acre. The best performance was that of Mr. Rosher with 430 gallons per acre, and he was followed by Bassett-Scarfe Bros., with 308 gallons.

An examination of the data was made to discover whether there was any indication of a relationship between stocking concentration and yield per acre. A scatter diagram of the individual farms did not disclose any significant trend. A comparison of the stocking concentration and per acre output in each Zone is given in Table 17. As will be shown later, however, there does appear to be some relationship between cow and acre yields. The number of farms examined is of course too small to permit the drawing of any conclusions except where the relationships are particularly well defined.

TABLE 17.

BETTER DAIRYING COMPETITION—1948-49.

Zone	Acres utilised per milch cow	Average production of Butter-fat per acre
Zone 1	4·1	64·5
Zone 2	4·1	49·0
Zone 3	4·3	53·2
Zone 4	5·3	41·6
Zone 5	3·1	66·3
Zone 7	4·7	45·7
All Zones	4·4	52·6

It is considered that the movement in the average output of butterfat or milk per acre is the best available indication of trends in the efficiency of dairy farming. The sample of farms is small and therefore apparent violent fluctuations in the figures may occur from year to year, but over a period of years the indications may be accepted as reasonably reliable.

A well constructed dam supplying stock and houses. Rooney Bros., Glen Warren, Manjimup.

The data already given shows that the average for this competition is the highest on record.

In Table 16 details of yields per acre in all Zones for all competitions are given.

An examination of the figures in this competition shows that there is an upward trend in butterfat per acre as cow yields rise. For obvious reasons this rise is not uniform but over the number of farms there does appear to be a correlation. This lends point and support to the contention that one of the easiest ways to increase total production is by raising cow yields. It is admitted that high per acre yields can be achieved with low production per cow where stocking concentration is dense, but it is clear that similar results could have been obtained with fewer cows of higher capacity and at a lower labour and feed cost. The ideal seems to be high cow yields, which combined with heavy stocking must result in high per acre production.

However, an attempt to stock heavily with this end in view would lead to disaster, and farmers are advised to plan within the present carrying capacity of their farms, and strive towards higher yields from the cows. As husbandry improves it will probably be found that stocking concentration can be increased. In other words the degree of stocking is set, partly at least by the efficiency of farm management.

In table 18 is given the names of those farmers who produce more than 100 lbs. fat per acre, together with some information regarding the stocking of their properties. The acreages refer to the areas used for dairying exclusive of any other class of livestock.

TABLE 18.

HERDS OVER 250 LBS. FAT PER COW AND 100 LBS FAT PER ACRE.

Name	Yield per acre	Yield per Cow	Acres per Cow-unit	Acres per equivalent large beast
	lbs.	lbs.		
E. Rosher	171	257	1·3	1·0
Bassett-Scarfe Bros.	123	376	3·2	2·2
W. Wilde ..	118	265	2·3	2·0
J. Lukin ..	107	337	3·1	2·0
W. J. Smith . .	105	343	3·2	1·6

C. *Bulls.*

Of a total of 80 bulls on competing farms 74, or 92.5 per cent. were pure bred. Of the grade bulls, three were in herds in Zone 1, the milk area, but these herds had also one or more pure bred bulls. In the other Zones (butterfat herds) 94.5 per cent. of the bulls were pure bred.

The distribution according to breed in Zone 1 and other Zones is shown in Table 19.

TABLE 19.

BULLS IN HERDS WERE PURE BRED BULLS ONLY.

Breed	Zone 1	Zones 2, 3, 4, 5 & 7	All Zones
A.I.S.	4	12	16
Jersey	2	12	14
Guernsey	1	12	13
Fresian	1	1	2
Red Pole	1	...	1

It is evident from the comments of the Judges that farmers acknowledge the value of good bulls, but it is disappointing that of the 74 pure bred bulls in use 60 were from untested dams. All farmers are now aware that the only sure indication of a sire's real value is in the performance of his progeny. In the absence of sufficient data to judge an animal in this way, the next best method is to select a son of a proved bull from a good cow, or at least from a known line of high producers. The figures for all herds indicate that the herds with pure bred standard bulls only and including 1,606 cows averaged 239·2 lbs. butterfat which is above the average for all herds. It follows that herds with pure bred bulls from untested cows or with grade bulls, would yield much lower—in fact 204 lbs. only.

UTILISATION OF SKIM MILK.

As the majority of farmers in this State are supplying cream to butter factories they have a quantity of skim milk for use at home. An attempt was made to measure the efficiency of its use by allocating a maximum of 50 points, where calves or pigs were fed in sufficient numbers. All Judges were provided with a schedule for calculating calf or pig months. This is an abitrary scale but serves as a useful means of assessing the level of skim milk feeding and has proved easy in application.

The schedule is as follows :—

Calves	5	months	feeding.
Baconers	5	do.	do.
Porkers	3	do.	do.
Slips	2	do.	do.
Weaners .. .	1	do.	do.

Maximum points were awarded when 12½ feeding months per cow were obtained. For each feeding month under 12½ a deduction of four points was made.

In all Zones for 1,964 cows, 962 calves and 1,725 pigs including 115 sows were fed.

Excluding all farms from which milk is supplied either to the metropolitan area or to cheese factories the figures were :—

1,166 cows ; 732 calves ; 1,631 pigs including 113 sows.
In the milk producing farms the position was :—
798 cows ; 230 calves ; 94 pigs including 2 sows.

Details of the position in each Zone is given in Table 20.

TABLE 20.
UTILISATION OF SKIM MILK.
Number of Calves and Pigs Fed.

Zone	Cows	Calves	Pigs excluding Sows	Sows	Total Calves and Pigs	Ratio Calves and Pigs to Cows
Zone 1	608	153	55	1	208	0·34
Zone 2	209	180	348	24	528	2·5
Zone 3	230	184	295	25	479	2·1
Zone 4	400	265	324	31	589	1·5
Zone 5	161	32	225	9	257	1·6
Zone 7	286	148	363	25	511	1·8
All Zones total	1,964	962	1,610	115	2,572	1·3

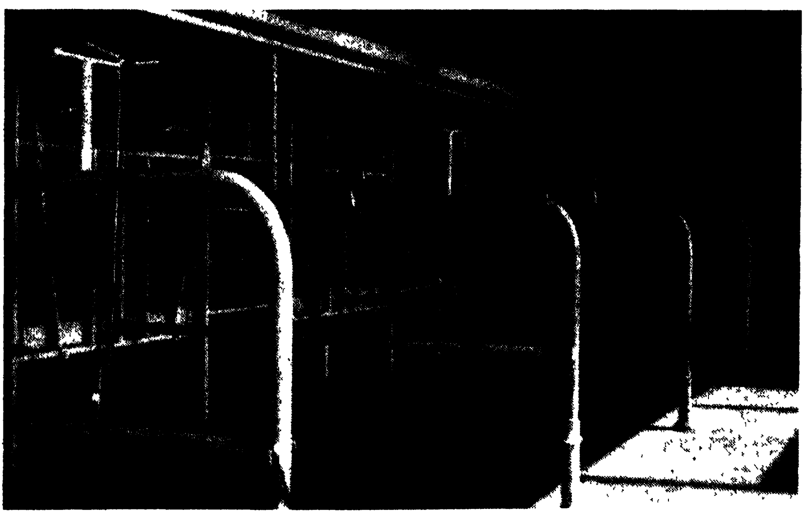
Rearing of Young Stock.—Some pleasure can be expressed at the number of calves which are being reared for herd replacement. It is considered that 50 per cent. of all heifer calves should be retained for replenishing losses due to wastage, i.e., culling, death and sales. This represents 25 per cent. of all calves dropped. This figure allows a margin for losses in rearing and for the sale of a few surplus, young animals.

These are necessarily average figures and as a guide to the individual farmer who may not get a calf from every cow or may not have an even drop of heifers and bulls. The requirements for herd replacement may be stated as calves equal in number to 25 per cent. of the herd size.

The figures in Table 21 show that the number of calves reared represents a little under 50 per cent. for all zones. It is not possible to say how many bull calves were fed but general advice from the judges was that the great majority of calves were heifers. If the milk producing figures are excluded (see above) the number of calves reared on the remainder producing cream represents 63 per cent. of the herd numbers. Thus it may be considered that ample reserve for replenishing herds exists on these farms. Further that there is considerable margin for sale or for the development of larger herds to use the gradually extending areas of pasture.

The largest proportion of calves reared was in Zone 2, where most competitors reared all calves with the exception of a few which were dropped late in the season. Mr. D. O. Briggs was the only competitor to rear a calf for each cow in the herd.

Mr. J. P. Norton in Zone 2 reared 62 calves from 64 cows and Mr. S. C. Maidment of Zone 4, 71 calves from 73 cows. On each of these farms a large number of pigs were raised also.



A modern milking shed. Denmark Research Station.

Pig Raising.—Pig raising is an essential and profitable adjunct to butterfat production. Hence any discussion of the efficiency of dairy farming should also have reference to this activity. During the recent war efforts were made successfully to stimulate production, but more recently there has been evidence of a considerable decline, which in view of the relatively high prices which are offering can only be explained by the disinclination of farmers to buy wheat for supplementing

the skim milk because it can be bought in quantity only in bulk and also because of the higher price at which it is available. Examination of the reports however while at first tending to support the contention of a decline, shows instead that excluding the milk producing farms, pig raising has not declined compared to the position disclosed in other Better Dairying Competitions.

In Table 21 is given a comparison of the ratio of sows to cows with other years.

TABLE 21

COMPARISON OF NUMBER OF COWS PER SOW.

Zone	Cows	Sows	Number of Cows per One Sow.					
			1948–1949	1935–1936	1934–1935	1933–1934	1932–1933	1931–1932
1. Coastal .	608	1	608	22·8	23·6	34·5	...	
2. Bunbury - Donnybrook	269	24	11·2	11·7	10·2	10·7		...
3. Busselton-Margaret River	230	25	9·2	6·2	6·9	15·9		..
4. Bridgetown ...	400	31	12·9	8·6	10·9	11·2	.	....
5. Manjimup - Northcliffe	161	9	48·0	9·7	11·6	10·6	..	...
7. South Coastal ..	286	25	11·4	.	8·4	12·3		..
All Zones ..	.	..	17·1	11·2	12·5	14·2	10·7	6·7
Butterfat farms only		.	10·3	.	.		.	....

The number of sows in Zone 1 was always lower than in the others and its inclusion in the figures intended to make the degree of which pig raising was carried on less than was actually the case where skim milk was available for feeding. On this occasion only one sow was kept in the whole of their zone.

Excluding the farms in Zone 1 and those in Zone 2 supplying milk to a cheese factory the ratio is 10·3 cows per sow.

However, the simple ratio of cows per sow may not always give a true picture of the pig fattening activities of farmers as some may sell pigs as weaners, others as baconers and with the same ratio of sows to cows there would naturally be considerable difference in the usage of skim milk.

To give some idea of the system followed by most farmers information was collected to show how the pigs were sold. As will be seen in Table 22 the great majority were fed to the baconer stage.

TABLE 22.

DISPOSAL OF PIGS.

Pigs Sold as	All Zones	Excluding Zone 1	Excluding All Milk Producing Farms*
Baconers . . .	1,232	1,177	1,140
Porkers	44	44	444
Slips	12	12	12
Weaners . . .	175	175	175
Choppers . . .	10	10	10
Number of Cows ..	1,964	1,356	1,166

Butterfat producing farms only.

This is pleasing as the ratio of 10·3 cows per sow is low compared to many suggestions which have been made regarding the number of sows which should be kept. This actually must depend on the stage at which the progeny is marketed.

However the number of pigs which could be fattened on most of the farms could be increased easily to the profit of the farm, by the use of more wheat. This would reduce the margin gained on each pig but increase the overall profit.

The average sales were one bacon pig for each cow milked after making allowance for porkers, slips and weaners.

It is suggested that the aim by all dairy farmers should be two bacon pigs per cow. That this is not an impossible objective is proved by the performances of the following farmers :—

J. P. Norton, Zone 2—56 cows ; 156 baconers.
J. Bashford, Zone 5—36 cows ; 42 baconers ; 30 porkers ; 48 weaners.
H. S. Moyes, Zone 4—31 cows ; 61 baconers ; 13 porkers.
Mrs. M. A. Crute, Zone 2—26 cows ; 54 baconers.

Cattle appreciate shade.

Some 19 years ago the Department of Agriculture after consultation with bacon owners and breeders recommended farmers to concentrate on the Berkshire and Tamworth breeds to procure pigs suitable for pork and bacon and for export.

This policy has been advocated since with a view to the standardisation of the type of pig used with the ultimate aim of improving quality.

The large White Breed also received approval although it was considered not so suitable for local trade owing to its later maturity. There is no question of its suitability for markets, including export, requiring large carcasses.

The breeds in use by competitors are shown in Table 23.

TABLE 23.

BREED OF SOWS.

Breed	Number of Sows*			Percentage		
	1948–1949	1935–1936	1934–1935	1948–1949	1935–1936	1934–1935
Berkshire	13	26	26	12·9	14	21
Berkshire × Tamworth	45	120	75	44·5	64	61
Tamworth	14	....	. ..	13·9	....	....
Large White	11	4	9	10·9	2	7
Others	18	38	14	17·8	20	11

* 14 breed not recorded.

It will be seen that there has been a decline even though small in the popularity of the Berkshires and Berkshire-Tamworth Cross. This is balanced from one point of view by the inclusion of 14 pure bred Tamworth sows. This however is not a good trend as the Berkshire-Tamworth and the pure Berkshires will provide carcasses superior to those from the pure Tamworths. The fact that the breed of 14 sows was not recorded could have an effect on the apparent popularity of the breeds, as disclosed by the figures.

There has been a strengthening in favour of the Large White, and the judicious use of these pigs, pure or as crosses with the Berkshire is likely to provide good quality carcasses.

The proportion of other breeds and crosses appears to be as for other years.

FARM MANAGEMENT.

Under this heading points are allotted for the layout of each property in respect to efficient use and convenience ; its sanitation in a general sense and in particular around and in the dairy building and finally for the manner in which farm records were kept. The scale of points as a whole can be accepted as a measure of overall farm management.

The trend towards improved layout, better buildings and facilities have been observed for some time while the manner in which accounts and other records are kept have been improved considerably in recent years.

Mr. A. L. Hamilton, Dairy Adviser, reporting on Zone 3 said " It was evident on most of the properties that thought has been given to the layout, and in two instances extensive rebuilding and improvement to sheds and yards were in progress. Points were lost in some cases through lack of conveniences in the appointments of the bails and milkrooms, although they complied in major respects with the minimum requirements under the model by-laws. The restricted supplies of building materials, particularly cement, and fencing wire have prevented extensive improvements in layout and conveniences."

The investigations of the Commonwealth Joint Dairy Costs Advisory Committee have shown that labour is the largest single item of cost in producing a pound of butter-fat. Any improvement to give greater convenience or any labour saving device or equipment must therefore tend towards greater profit. In this regard the comments of Mr. K. W. Simes, Dairy Instructor and Judge of Zone 4 are of interest, " The

The main farm roadway, Denmark Research Station. Straight fence and yard lines and painted buildings are attractive

winning farms are far larger than the average, yet their holdings are among the most highly developed in the Zone. The number of men employed on each, and the man-hours worked per annum would not exceed that of the average farm. Yet the results are superior."

SUMMARY OF LESSON WHICH MAY BE DRAWN FROM THE RESULTS.

1. *Fodder Conservation.*

(a) The aim of providing 2½ tons of hay per cow-unit or its equivalent in silage or summer crop has been proved desirable.

(b) The achievement of most competitors in this respect was disappointing although in no case was there evidence of poor condition in stock as a result. However, it was obvious that yields from the cows were lower than would have been the case had larger supplies been available.

(c) Planning of the conservation programme should be in advance of the actual harvesting season. This includes not only the preparation of paddocks for cutting but also arrangements for cutting, baling and carting.

(d) To provide the equivalent of 2½ tons of hay per cow-unit, it is suggested that hay, silage and green fodder be available. This could be provided by conserving. 1¼ tons of hay and 1½ tons of silage per cow plus ¼ acre of green fodder or 1½ tons hay and 3 tons of silage per cow-unit.

Lucerne is a crop which merits more attention particularly where irrigation is possible for spring planting.

(e) Early cultivation is essential for summer fodder crops, with planting at times to give a continuous supply of green material to supplement the reserves of hay and silage.

(f) Owing to the disinclination of farmers to plant sufficient summer fodders because of the labour involved in cutting and feeding, their attention could be given to crops such as Sudan grass, Japanese Millets and Sacchaline which can be grazed.

2. *Pastures.*

(a) Pastures can be improved by the incorporation of high yielding grass species with Subterranean clover.

(b) Perennial species where possible will extend the grazing periods.

(c) Cultivation of winter pastures early in the autumn is profitable.

(d) Chain harrowing to spread droppings makes the paddocks more even in growth and palatable to stock.

(e) Top-dressing at two cwt per acre is the optimum plus copper sulphate in areas where it is proved necessary.

(f) Liquid manure (E. Rosher) has proved advantageous.

(g) Carrying capacity is best adjusted to 4 to 4½ acres per cow.

(h) Overstocking will not increase profit.

3. *Dairy Herd.*

(a) Good quality stock are the best and enable higher output per labour unit.

(b) Lactations generally were short ; due principally to the lack of provision of feed during summer months.

(c) Early calving is practised by most except those in the whole milk areas.

(d) Most competitors appreciate the value of Standard bulls but more attention is needed to the selection of proved bulls.

4. *Utilisation of Skim Milk.*

(a) Skim milk is too valuable to waste.

(b) It should be used to rear heifers for herd replacement, with a surplus for sale.

(c) After supplying needs of calves the surplus of skim milk should be used for feeding pigs.

5. *Pigs.*

(a) Although the number of pigs fattened on butterfat farms was equal to other competitions, the objective of two bacon pigs per cow should be adopted.

(b) Breeding young pigs generally is more profitable than buying weaners or stores.

(c) The Berkshire, the Berkshire-Tamworth Cross, and the Large White provide suitable carcasses and are economical growers.

SUMMARY OF DATA.

Number of competitors	53.
Average size of herds	37.
Average Area Pasture per farm	163.5 acres.
Average area per cow	4.4 acres.
Average area per head	2.2 acres.
Average yield per cow	233 lbs. butterfat.
Average yield per acre	52.6 lbs. butterfat.
Fodder Conserved per Cow.	
Hay	1.2 tons.
Silage	0.28 tons.
Green Crops	0.1 acres.
Equivalent as Hay	1.55 tons.
Pigs.	
Ratio cows to sows—	
All Zones	171 : 1
Butterfat farms	10.3 : 1
Number of bacon pigs sold per annum—	
Per cow	1.0
Per sow	10.4

ANALYSES OF FEEDING STUFFS

RESULTS of Analyses of samples of Feeding Stuffs taken under the Feeding Stuffs Act, 1928-1946.

(Published under section 9 of the Act.)

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid. P_2O_5.	Lime. Ca.	Others.	
		%	%	%	%	%	%	%	%
	Anchorage Butchers. Ltd.								
	"Coogee" Meatmeal—								
	Registered Analysis	†36 9	*18 6	*1 3	*1.0	*12 73	11 43	.	....
28-9-48	Sample Analysis . .	42.5	13 2	0 9	0 45	11 1	9 98	.	...
	Barrow Linton & Co.								
	"Dukko" Fattening Mash—								
	Registered Analysis .	†10 0	†4 0	*4 0	*1 0		3 0		.
17-9 48	Sample Analysis	14.7	4 6	5 2	0.92		3 04		
	"Excelsior" Meat and Bone Meal—								
	Registered Analysis	†38 0	*15.0	*1 5					
17-9-48	Sample Analysis	39 8	13.6	1 6					
	W. R. & N. N. Clarke.								
	"S.M.P." Meat and Bonemeal—								
	Registered Analysis .	†50·0	*13·0	*2·0					.
20-1-49	Sample Analysis	50·0	11·7	2·5			.	.	
	David Gray & Co., Pty Ltd.								
	"Western" "A1" Laying Mash—								
	Registered Analysis . .	†14·0	†3·0	*5·0		2·0	0 5		
12-1-49	Sample Analysis .	14·2	3·0	5 1		1·08	0·46		
	"Western" Laying Mash "B"—								
	Registered Analysis .	†12·5	†3·0	*5·0		2·0	0·5	.	
12-1-49	Sample Analysis ..	11·8	2·9	4 7	.	0 43	0·07	.	..
	"Western" Pullet Food—								
	Registered Analysis .	†25·0	†7·0	*5·0	.	1 0	0·5	.	.
25-10-48	Sample Analysis ..	20·2	4·6	2·6		4·24	10·5		..
	"Western" Chickbuilder—								
	Registered Analysis	†14·0	†4·0	*4·5		2·0	0 5		
22-11-48	Sample Analysis	13·4	4·7	5·5		1·95	0·6	..	
	Haynes & Clements.								
	"H & C" Chickfood—								
	Registered Analysis .	†9 0	†1.5	*4 5			3 0		
2-9-48	Sample Analysis	9 0	1 7	2 8			3.24		
	J. Kitchen & Sons Pty., Ltd.								
	"Apollo" Bone and Meatmeal—								
	Registered Analysis	†40·0	*11·0	*2·5		14·0			. .
8-12-48	Sample Analysis . .	45·5	6·5	1·2	.	15 3			.
	Kraft Walker Cheese Co.								
	"Krafco" Dried Whey Powder.—								
	Registered Analysis	†10 0	†0.5	**Nil*	Lactose 68 0	1 0	0 7		
25-10-48	Sample Analysis	13 0	0.2	0 1	68 2	0 96	0 72		.
	W. H. Milne & Co.				Sodium Chlor.				
	"Millers" Laying Mash No. 1.—								
	Registered Analysis	†14.0	† 4 0	* 5.50	* 1 5	* 2 0	* 3 0		.
26-10-48	Sample Analysis . .	15 3	4 6	4.8	1 32	1 64	1 51		. . .
	"Millers" Chickstarter.—								
	Registered Analysis	15 0	† 4.0	* 5.5	* 1.0	* 2 0	* 2 5	....	.
26-10-48	Sample Analysis	†15.1	4 3	3 3	0 89	2 07	2.59		
	James E. Shaw.								
	"Champion" Meatmeal—								
	Registered Analysis ..	†50·0	*15·0	*5·0		..	. . .	. . .	.
17-1-49	Sample Analysis	51·7	12·2	2·2	. . .	.	. .	. . .	
	South-West Dairy Farmers Co-op.								
	"Sunnywest" Dried Buttermilk								
	Registered Analysis ..	†32.1	†5.7	.	.			. . .	.
28-9-48	Sample Analysis . .	31.7	7 9	.	.		..	..	....
	W. Thomas & Co. (W.A.), Ltd.								
	"Thomas" Chickgrower—								
	Registered Analysis	†13·5	†2·5	*6·0	*1·25	...	*3·75	. .	. . .
17-1-49	Sample Analysis	15·2	3·2	4·8	1·41	.	2·31	. .	....

* Maximum. † Minimum.

ANALYSES OF FEEDING STUFFS—*continued.*

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime. Ca.	Others.	
		%	%	%	%	%	%	%	%
	"Thomas" Laying Mash No. 1—								
	Registered Analysis ...	†14·0	†2·5	*6·0	*1·5	...	*3·75	....	....
17-1-49	Sample Analysis ..	14·8	3·6	5·4	1·56	....	2·35	....	....
	"Thomas" Laying Mash No. 2—								
	Registered Analysis ...	11·0	2·5	6·5	1·5	....	3·75	....	....
12-1-49	Sample Analysis .	12·6	3·0	5·6	1·32	....	2·43	....	...
	"Thomas" Quicklay—								
	Registered Analysis	†35·0	*12·5	*4·0	*3·0	...	*15·0	....	....
18-1-49	Sample Analysis .	40·2	12·3	1·6	5·79	....	11·3	....	....
	"Thomas" Sweet Dairy Food—								
	Registered Analysis	†11·5	†1·5	*8·5	*1·75	..	*4·0	.	...
12-1-49	Sample Analysis .	12·9	2·8	7·3	1 75	. .	1·90	.	....
	"Thomas" Chickgrower—								
	Registered Analysis	†13.5	†2.5	*6 0	*1 25	.	3.75		
12-8-48	Sample Analysis ...	15.8	4 02	4.5	1.32		2.6		. .
	"Thomas" Chickstarter—								
	Registered Analysis .	†14 5	†2 5	*6 0	*1.25		3.75	.	..
12-8-48	Sample Analysis .	16 7	4.7	4 9	1.52	.	1 9	.	..
	"Thomas" Eggmilk—								
	Registered Analysis	†15 0	†5 0	*4 0	*3 0	.	*15 0		.
12-8-48	Sample Analysis	19.4	4 9	2 3	2 92		4.6		
	"Branato" Wheatmeal—								
	Registered Analysis	†8 0		*9.0					.
2-9-48	Sample Analysis	9.8		2 8		.	.	.	. .
	"N.A." Sterilised Bone Grit Meal -								
	Registered Analysis	†20 0			* 0 2	†22.0	†26 0		....
20-10-48	Sample Analysis	20 4			0 12	22.5	26.2		....
	"Pollato" Stock Meal.—								
	Registered Analysis	† 8 0		* 9.0					...
21-10-48	Sample Analysis	7.8		10 0			.	...	. .
	"Thomas" Pig Grower—								
	Registered Analysis .	†12.0	†1.5	*6.0	1 25		3.75	.	. .
27-9 48	Sample Analysis	13.8	2.4	3.7	1.21		2.86	.	....
	Tropical Traders, Ltd.								
	"Evelyn" Calf Food—							Sulphur	
	Registered Analysis	†10 5	†4.77	*3 86	*3 0		.	*0.75	.
11-8-48	Sample Analysis	9.4	2.8	2 3	3 1			1.3	.
	"Evelyn" Horsefood—								
	Registered Analysis .	†12 6	†5.7	*7.14	*6.0	0 9	1.1	*1.84	....
2-9-48	Sample Analysis	12 9	4.3	4.3	5.8	0.94	1.0	2.6	....
	W.A. Meat Export Works.								
	"W.A.M.E." Meatmeal—								
	Registered Analysis .	†45·0	*13·0	*2·0			.	...	....
20-1-49	Sample Analysis	50·4	11·5	2·4		.	.	...	....
	Westralian Farmers Co-op., Ltd.								
	"Wesfarmers" Chick Mash "A"—								
	Registered Analysis	†15.0	†4.0	*7.0	Trace	.	0.3	. .	....
11-8-48	Sample Analysis	15.9	4.9	4.1			1.5	..	....
	"Wesfarmers" Chickmash "B"—								
	Registered Analysis	†14.0	†4.0	*7.0	0 5	...	0.5	..	..
10-8-48	Sample Analysis	15.5	4.4	4.1	0.73	.	1.2	...	..
	"Wesfarmers" Growers Mash—								
	Registered Analysis	†13.0	†4.0	*7 5	0 5	..	0.7		....
10-8-48	Sample Analysis	14.2	3 7	4.9	0.88	.	1.3	....	....
	"Red Comb" Laying Pellets, No. 2—								
	Registered Analysis .	†11.0	†3.0	*7.0	0.5	.	0.8	...	....
1-8-48	Sample Analysis .	12.2	2.9	3.8	0.69	.	1.2	.	....
	"Wesfarmers" Laying Mash No. 2—								
	Registered Analysis ...	†11.0	†3.0	*7.0	0.5	....	0.8	....	....
27-9-48	Sample Analysis . .	11.7	2.2	4.6	0.70	....	1.18	...	....
	Wesfarmers" Chickmash "B"—								
	Registered Analysis .	†14·0	†4·0	*7·0	0·5	...	0·5	....	....
27-1-49	Sample Analysis .	17·0	4·6	4·6	1·11	....	1·38	....	....

* Maximum. † Minimum.

ANALYSES OF FEEDING STUFFS—*continued.*

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime. Ca.	Others.	
		%	%	%	%	%	%	%	%
	"Red Comb" Chick Pellets "A"—								
	Registered Analysis .	†15·0	†4·0	*7·0		....	0·3	...	....
27-1-49	Sample Analysis .	15·6	4·8	4·0	.	....	1·16	....	....
	"Red Comb" Chick Pellets "B"—								
	Registered Analysis	†14·0	†4·0	*7·0	0·5	.. .	0·5	..	
27-1-49	Sample Analysis	17·5	4·8	4·6	0·32	...	1·48	....	....
	"Wesfarmers" Growers Mash—								....
	Registered Analysis ...	†13·0	†4·0	*7·5	0·5	...	0·7	....	
24-11-48	Sample Analysis ...	14·5	3·2	4·1	0·72	...	1·5	.	....
	"Red Comb" Growers Pellets—								....
	Registered Analysis .	†13 0	†4·0	*7·5	0·5	..	0·7	.	
23-11-48	Sample Analysis	14·1	4 4	4·7	0·74	...	0·8	.	....
	"Red Comb" Growers Pellets—								....
	Registered Analysis	†13·0	†4·0	*7·5	0·5	....	0·7	....	
26-1-49	Sample Analysis	13·9	3·7	4·4	1·07	...	1·16	..	..
	"Wesfarmers" Laying Mash No. 1—								....
	Registered Analysis ..	†14·0	†4·0	*7·0	0·5	..	1 0	.	
22-11-48	Sample Analysis .	13·5	3·6	4 7	0·69	..	1·9	..	....
	"Red Comb" Laying Pellets No. 1—								....
	Registered Analysis	†14 0	†4·0	*7 0	0 5	.	0·8		
23-11-48	Sample Analysis ..	13·4	3·1	3·8	0 52		1·8		....
	"Red Comb" Laying Pellets No. 1—								....
	Registered Analysis ..	†14·0	†4·0	*7·0	0·5		0·8	....	
26-1-49	Sample Analysis	14 1	4 0	4 2	0 60	.	2·0	.	....
	"Red Comb" Laying Pellets No. 2—								....
	Registered Analysis .	†11·0	†3·0	*7·0	0·5	.	0·8	..	
24-11-48	Sample Analysis . .	11·8	3·1	4·2	0·64	.	1·4	..	....
	"Wesfarmers" Protein Meal "B"—								....
	Registered Analysis ..	†35·0	*10·0	*4·5		.	5 0	....	
18-1-49	Sample Analysis .. .	35·1	11·2	2·0	.	.	8·27	...	....
	"Wesfarmers" Sweetened Dairy Meal—								....
	Registered Analysis	†11·0	†2·5	*6·0	1·0	.	0·7	.	
2-2-49	Sample Analysis . .	9·20	2·6	10·5	1·28	.	1·5	.	....
	Wrights, Ltd.								....
	"Wrights Meatmeal—								
	Registered Analysis	†40 0	*11.0	*1.5		14.0	.		....
27-9-48	Sample Analysis	45 0	8.7	0.4	.	14 6	.	.	....
	"Pannifex" Poultry Pusher.—								
	Registered Analysis	†32 0	† 7.0	* 8 0			.		....
20-10-48	Sample Analysis .	32 8	8 1	8 2			..	.	....
	R. B. Young.								
	"Morlay" Growing Mash—								
	Registered Analysis ..	†12 5	†3·0	*5·5	*1·5	*4·0	†2·5	..	....
19-1-49	Sample Analysis .. .	13·3	3·8	4·2	1·11	4·26	4·24	..	....
	"Morlay" Fattening Mash "D"—								
	Registered Analysis . .	†10·5	†3·0	*5·0	1·5	3·5	2·0	....	....
19-1-49	Sample Analysis ..	12·7	3·6	4·1	1·13	3·86	3 77	...	....
	"Morlay" Laying Mash.—								
	Registered Analysis	†14 0	† 3 0	* 5 5	* 1 5	* 3.5	† 2.5	..	....
27-10-48	Sample Analysis	15.1	4.4	4 8	1 17	2.48	2.22		....
	"Morlay" Laying All Mash.—								
	Registered Analysis .	†13.0	† 3 0	* 6 0	* 1.5	* 4.0	† 2.5		....
27-10-48	Sample Analysis	15.7	4.8	5 2	1.25	2.34	2 11	.	....

* Maximum. † Minimum.

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PHOSPHORUS DEFICIENCY IN DAIRY COWS

ITS PREVALENCE IN SOUTH-WESTERN AUSTRALIA AND POSSIBLE METHODS OF CORRECTION

L. C. SNOOK, Animal Nutrition Officer.

DURING the past fifteen months an intensive investigation has been carried out to determine if nutritional deficiencies are in any way the cause of infertility in dairy cattle in the areas south of Busselton. Difficulty in getting cows stocked at the correct time has long been a problem, and the wastage through sterility is proving very costly to individual farmers. In co-operation with Veterinary Surgeon Harley, an effort has been made to find out if this seasonal infertility is a specific problem restricted to the areas in question, or whether it is merely a variant of one of the recognised forms of infertility now causing serious losses wherever dairying has become a major industry. These investigations are still in progress and will require much more detailed, controlled experimentation before authoritative statements can be made. At this stage, however, it is desired to report one of the findings because of its immediate practical implications.

In selected herds blood samples have been collected at monthly intervals for over a year. These samples have been analysed for a variety of constituents but only one abnormality has been detected, namely a persistent subnormal blood inorganic phosphorous. Persistent low values of the order found have always been taken to indicate phosphorous deficiency in the diet, which in turn may lead to ill-health, lowered milk production, sterility, and poor development of the young animals. But in the present investigation low blood phosphate levels have been found in a number of herds where the cows were producing well and appeared to be in excellent health. And of more importance, these subnormal values have been found not only during the summer months when the dry feed contains relatively little phosphate, but also throughout the winter months when abundant young green pasture of excellent quality was available. This raised the question as to whether the animals were indeed suffering any ill-effects from this commonly-seen subnormal blood inorganic phosphorus. To settle this point experiments are projected to determine just how much milk production, body growth, and fertility are influenced by the levels of phosphorous found in South-West herds. Meantime, however, it must be

accepted that while the blood is low in such an important constituent as phosphorus there will be a reduction in all-round efficiency. Because of this, tests were carried out to determine how to restore the blood phosphorus to normal, and how to do this with least expense and inconvenience. The result of these tests are recorded in this preliminary paper because they draw attention to a number of points of immediate practical importance.

Productive Dairy Cows Require Phosphatic Supplements All the Year.

This is an important fact which needs considerable emphasis. Farmers in this country have been advised by the Department of Agriculture about the dangers of phosphorus deficiency for many, many years. Ever since the classic work of Sir Arnold Theiler and his associates in South Africa it has been realised that, under our climatic conditions, cattle need phosphatic supplements during the long summer when dry mature herbage constitutes the bulk of the ration. Despite this Departmental advice, when this investigation was started very few dairy farmers were feeding any phosphatic supplement of any kind. During the war years such supplements had been difficult to procure and their use had necessarily ceased. Subsequently the farmers have tended to think that because they were now applying heavy annual topdressings of superphosphate to their pastures, and the establishment of perennials had greatly lengthened the period during which green feed was available, there was not the need now to supply additional phosphate to their stock in the form of mineral lick or bonemeal. Surely, it was assumed, the pasture itself would provide adequate phosphate to the grazing animal.

To check this assumption the author collected many pasture samples for analysis and the very important fact was established that, although the South-West mixed pastures were of excellent quality, being particularly rich in crude protein and total phosphorus, these pastures *at their best* could only supply enough phosphorus to satisfy the requirements of a cow producing between three and four gallons of milk per day. During the bulk of the year these pastures would do little better than satisfy the requirements of a two-gallon cow. A cow can eat only so much pasture per day and this "so much" will not meet the requirements of the heavy producer. As can be seen from Table I the pastures in the areas studied are of high nutritive value but it can be shown by calculation, using the standards set out by the Nutritional Research Council, U.S.A. (1946) and by Kellner (1926), that a dairy cow producing more than three gallons of milk will not be able to eat enough to satisfy her need for phosphorus. This explains why, in the herds being studied, the cows which calved at the

TABLE I.

COMPOSITION OF PASTURES, MARGARET RIVER AREA.
AVERAGE RESULTS.

Composition as a Percentage of the Dry Matter.

Date Collected	Number of samples	Description	Crude Protein	Crude Fat	Crude Fibre	Carbo-hydrate	Ash	Calcium as Ca	Phos-phorus as P
August 1948	6	Green mixed pasture, grazed	25	3	21	40	11	0.9	0.35
October 1948	6	Green mixed pasture, grazed	22	4	22	44	8	1.0	0.32
November 1947	6	Good quality meadow hay	13	2	28	49	8	0.9	0.19
For Comparison. Typical British Pasture, grazed			20	4	20	46	10	1.0	0.3

beginning of winter with low blood phosphorus levels (and presumably low body reserves because of the dry feed during the summer) could not possibly milk well and at the same time "pick up," despite the excellent pasture. One of two things happened: the heavy producer depleted her body reserves in order to maintain production, or she produced less milk. In either case the farmer stood to lose, because obviously, if cows continue to rob their bodies to maintain production the general health and well-being must eventually suffer. Also important is the fact that if the cows become depleted during the winter they have no chance to build up while "dry" in the summer as the feed is then characteristically deficient in phosphorus. It could easily be that some such sequence as this explains the breakdown of many high producing cows. The need to supply phosphate to the good cow on good pasture seems to have escaped notice and should be given all the emphasis possible. With improved pastures the farmers are now keeping better cows. These better cows are the very ones which need the phosphatic supplement—while milking because milk is rich in phosphate, and while dry in order to replenish the skeleton and build up the developing foetus. The need for phosphatic supplements is obvious and steps were therefore taken, firstly to show that phosphatic supplements alone would restore the blood to normal and secondly to determine which supplement was the cheapest for extensive use.

The Effect of Sterilised Boneflour.

The first test was made with a well-known commercial phosphatic supplement in the form of sterilised boneflour. This was used to show that if depleted cows received a generous supplement, the blood phosphorus could quickly be restored to normal. In January, 1949, through the co-operation of a Cowaramup farmer, 20 cows were made available for the experiment. These were in the last month of their lactation and had shown low blood inorganic phosphorus levels throughout 1948. As can be seen from Table II, the deficiency was quite serious when the experiment began, the average value for blood inorganic phosphorous being only half normal. Twelve cows were then fed a supplement made up by mixing the boneflour (140 lb.) with bran (120 lb.) and coarse salt (180 lb.). This supplement was consumed in the bails at the rate of approximately one pound per head daily, this supplying about 20 grams of phosphorus (as P), or as much as that present in five oz. of commercial dicalcic phosphate. The remaining eight cows were used as controls. They ran with the test cows so that conditions were the same for all animals.

The results of the test are given in Table II. The supplement had a marked effect on the blood phosphate levels, the average for the test group doubling in a month that is, it increased from 2.5 mg. to 5.0 mg. per 100 ml. Some of the control cows also showed a marked increase in blood phosphorus, the average increase for the group being from 2.4 mg. to 3.9 mg. This increase was not unexpected, however, as the controls also consumed additional phosphorus. As before stated, the two groups of cows ran together, a desirable method of ensuring similar treatment, but it was found difficult to prevent the control cows from eating varying amounts of the supplement given to the test cows. Also it so happened that during the month of the test the pastures were topdressed with superphosphate and some of the control cows were seen eating lumps of superphosphate scattered among the dried herbage.

The results indicate, however, that, so long as additional supplies of phosphorus are made available to dairy cows, there is a quick improvement in the level of the blood inorganic phosphorus.

TABLE II.

EFFECT OF PHOSPHATIC SUPPLEMENT FED IN BAILS (COWARAMUP).

The supplement, a mixture of boneflour, bran and salt, contained 4.4 per cent. P, equivalent to 20 g. per pound.

SUPPLEMENTED GROUP : feeding commenced on 26/1/1949.

	Blood Inorganic Phosphorus—mg/100 ml.		
	7-12-48	25-1-49	28-2-49
Patches	2·7	1·9	4·0
Mollie	3·7	2·3	3·4
Trixie	2·7	2·3	4·7
Queeny	4·0	2·5	5·0
Jean	2·6	2·1	4·7
Biddy	2·4	4·5	4·9
Tiger	3·3	2·3	3·5
Susan	2·7	2·2	6·1
Minnie	4·0	2·0	6·1
Cherry I.	..	3·3	5·5
Rusty	..	2·6	6·6
Nora	..	1·9	5·9
	3·1	2·5	5·0

CONTROL GROUP.

	27-1-49	28-2-49
Sarah	2·7	3·5
Sally	1·9	2·6
Gypsy	2·0	3·2
Strawberry	2·7	4·0
Beauty	2·9	4·0
Brenda	2·2	4·7
Dorothy	2·6	5·7
Merle	1·8	3·2
	2·4	3·9

The cows in the control group were not supposed to receive any supplement but they were milked along with the test cows and took every opportunity to obtain the " lick." Some of the control cows were also seen eating superphosphate applied as top-dressing to the pastures.

Sodium Phosphate in the Drinking Water.

The next step was to show that it was the phosphorus in the supplement, which was the cause of the improvement, rather than some other substance supplied in the bran, or the salt, or the boneflour. Phosphate was therefore supplied to ten cows as pure sodium phosphate in the drinking water, the chemical being added at the rate of five pounds per hundred gallons of water. On the assumption that the cows consumed ten gallons of water per head per day this meant that each animal received about 18 grams of phosphorus per day (about as much as would be supplied by 6 oz. bonemeal). The water treated in this manner was consumed in normal

quantities, without any evidence of distaste. The effects produced by this supplement are recorded in Table III. The results indicate that the marked improvement produced by the feeding of the boneflour mixture could be maintained by the drinking of water treated with pure sodium phosphate. Also, that the treated water would effectively lift subnormal blood values to normal. In contrast, high values produced by the feeding of the boneflour quickly fell when the supplement was withdrawn.

TABLE III.

EFFECT PRODUCED BY SUPPLYING SODIUM PHOSPHATE IN THE DRINKING WATER.

GROUP I.

Cows receiving treated water after March, 1st. Ten gallons contained 18 grams of phosphorus as P.

Blood inorganic phosphorus in mg. per 100 ml.

	25-1-49	28-2-49	4-4-49	
Mollie	2·3	3·4	4·3	The improvement produced by the boneflour maintained by the treated water.
Trixie	2·3	4·7	4·9	
Biddy	4·5	4·9	4·8	
Minnie	2·0	6·1	5·2	
Merle	1·8	3·2	5·2	"Controls" from the previous month improved when placed on treated water.
Sally	1·9	2·6	7·1	
Strawberry	2·7	4·0	5·9	
Gipsy	2·0	3·2	5·4	
Cherry			5·3	Extra cows placed on treated water.
Daisy			6·7	
Average	2·4	4·0	5·5	

GROUP II.

Control cows on ordinary drinking water. No phosphate supplement after 28th Feb.

	25-1-49	28-2-49	4-4-49	
Patches	1·9	4·0	2·4	These cows all show decline in blood level when no longer receiving phosphatic supplement.
Queenie	2·5	5·0	3·2	
Jean	2·1	4·7	2·4	
Cherry I.	3·3	5·5	3·7	
Rusty	2·6	6·6	3·0	
Nora	1·9	5·9	3·2	
Sarah	2·7	3·5	3·2	
Beauty	2·9	4·0	3·0	
Dorothy	2·6	5·7	2·9	
Brenda	2·2	4·7	3·7	
Average	2·5	5·0	3·1	

The provision of phosphatic supplements through the drinking water has many advantages and the use of sodium phosphate in this manner has long been a standard practice in parts of the U.S.A. Unfortunately this compound is far too expensive for use in a like manner in this State, and a cheaper alternative had to be found.

Superphosphate as a Supplement.

In Table IV the relative costs of various phosphatic supplements have been recorded. It can be seen that superphosphate is easily the cheapest source of phosphate. In the past superphosphate has at various times been used for feeding to stock by mixing it with salt and molasses to make it palatable. But its use in this manner has never been encouraged, as about half the bulk of superphosphate consists ofgypsum which is quite useless to the animal, and it may also contain potentially dangerous amounts of fluoride. But there seems no reason why superphosphate

should not be used in the drinking water, as the gypsum and the calcium fluoride are both very insoluble and sink to the bottom in the form of a sludge. As bone-meal and boneflour are both in limited supply, and dicalcic phosphate is relatively expensive, tests were therefore made to see if superphosphate could be used in the drinking water to supply phosphate to cattle. The main trial was made on a property at Witchcliffe where the owner made some very thorough observations, using his herd of high producing Jerseys as test animals.

TABLE IV.

COST OF PHOSPHOROUS SUPPLIED IN VARIOUS SUPPLEMENTS

Retail Prices in Perth, April, 1949

	Cost	Percentage of Phosphorus as P	Cost per Unit of phosphorus
Superphosphate	£6 11s. per ton	8 per cent water soluble (18 per cent. P_2O_5)	9d.
Boneflour	24s. per 140 lb.	14 per cent. total	15d.
Bonemeal	15s. per 100 lb.	12 per cent. total	15d.
Dicalcic phosphate (concentrate)	36s. per 100 lb.	16 per cent. total	27d.
Dicalcic lick	22s. 9d. per 100 lb.	8 per cent. total	34d.

Infertility had become a very serious problem on this property. Blood samples were first taken early in December, the average blood inorganic phosphorus being only 3.4 mg. despite excellent green pastures, good milk production, and apparent freedom from disease. To correct this obvious phosphorus deficiency the liberal use of bone-meal was recommended and on 21st February, 1949, the use of superphosphate in the water was also suggested. Blood samples were again taken on March 1st by which time the average blood inorganic phosphorus had increased to 4.8 mg. per 100 ml. Just how much of this increase could be attributed to the use of bonemeal since December could not be judged, but from March 1st onwards no supplement other than superphosphate in the water was given. This was added to the water at the rate of 5 lbs. per 100 gallons. A control group of ten cows on similar pasture received only spring water. The results are recorded in Table V.

TABLE V.

USE OF SUPERPHOSPHATE IN DRINKING WATER OF DAIRY COWS. WITCHCLIFFE TEST COWS.

Blood inorganic Phosphorus—mg./100 ml.

Cow	Age	8–12–48 Cows producing well on excellent pasture	1–3–49 Bonemeal fed generously since middle December Superphosphate in water from 21–2–49	6–4–49 No Bonemeal or lick since 1–3–49 Super in water at rate of ½ lb. per cow per day
Maude	15	3·4	6·2	5·1
Lorna	15	2·4	4·2	4·6
Rene	12	2·3	4·5	4·7
Dainty	10	3·0	5·7	6·1
Hairs	9	3·7	4·6	5·2
Glad	5	4·0	4·3	5·3
Snow	5	4·2	4·7	4·7
Lankie	4	3·4	4·9	4·1
Rabbit	3	4·2	5·0	5·3
Tina	2	3·3	4·2	4·8
Average	....	3·4	4·8	5·0

CONTROL COWS.

Dry, on good pasture and normal water. No lick fed.

	6-4-49	
Night	4·4	Cows purchased in calf because insufficient could be bred on the the property.
Trilby	3·0	
Pride	2·6	
Velvet	2·6	
Fauno	2·3	
Brownie	2·5	Cows bred on property; dry for a month or longer. Denise dry for 12 months.
Denise	3·9	
Spot	3·1	
Blondie	2·5	
Tot	3·6	
Average	3·0	

From this Table it is very apparent that the dry cows on normal summer grazing without any phosphatic supplement have subnormal blood phosphorus levels, whereas the ten cows on similar pasture but receiving approximately 18 grams of phosphorus per day in drinking water treated with superphosphate were able to improve or maintain the normal levels which resulted from supplements given before March.

Apparently the addition of superphosphate to the water produced similar improvement on other properties but the absence of controls makes comparison difficult. In a Karridale herd, for example, the highest average value for blood inorganic phosphorous seen in 1948 following the use of bonemeal was 4.4 mg. per 100 ml. whereas in 1949 after adding superphosphate to the drinking water for about two months the average value of ten cows (five recently calved, five near calving) on June 2nd was 6.0 mg.

Methods of Using Superphosphate in the Drinking Water.

The methods used to supply water treated with superphosphate will vary according to conditions. On the properties where the tests were made, stock are watered from concrete containers holding about 600 gallons, and filled by windmills. These large containers were treated by adding daily half a pound of superphosphate for every cow drinking from the trough on the assumption that cows drink about ten gallons of water per day. It would be more exact and foolproof, of course, to treat a container full of water by adding five lbs. superphosphate per 100 gallons, using this, refilling, and again treating with superphosphate. In the wheatbelt where the stock water is conserved in dams, it would be a simple matter to treat the dam in one operation at the beginning of summer so making certain that all stock drinking this water would be assured of an adequate phosphorus intake. Incidentally, the gypsum in the superphosphate will clear the suspended mud from water—treated water is always crystal clear. Some farmers are adding the superphosphate to the large tanks from which drinking water is reticulated. The necessary periodic removal of the gypsum from the bottom of the tank may prove difficult. Perhaps this could be avoided if the required amount of superphosphate is mixed with two or three times its weight of water (5 lb. superphosphate to one or two gallons) and left to settle. The clear supernatant fluid will contain most of the phosphate and this could be decanted into the tank, the useless sludge being thrown away. Doubtless many "tricks" and modifications will be used but there seems no obvious obstacle to the wide use of "superphosed" drinking water. This would permit all stock to build up their phosphate reserves during the summer months when normally the reserves of this mineral are being depleted. The possibility must even be considered that if the cows freshen in the autumn with adequate reserves there may be no need for further supplements while good quality green feed is available.

One possible disadvantage may be mentioned. The addition of phosphate to the drinking water encourages a prolific growth of green algae and similar water plants. This growth is not necessarily harmful but it may offend those who like to keep the water troughs clear of plant growth. Copper compounds readily kill these water plants and the occasional use of copperised superphosphate may eliminate the objectionable growth, where it is considered to be objectionable.

Use of Saturated Solutions of Phosphate in Feeding-Stuffs.

The treatment of drinking water has its limitations on properties where there is abundant free water, and of course has little application during the rainy months. A valuable suggestion made by Mr. R. B. Leiper of Cowaramup has therefore been developed and may prove of wide application. Mr. Leiper suggested that saturated solutions of water soluble phosphate should be used to damp down foodstuffs. Tests showed that the saturated solutions prepared by mixing superphosphate with water contained about 180 grams of phosphorus (as P) per gallon ; in other words a pint would supply as much phosphorus as 7 ounces of bonemeal. This means that the fluid is quite a rich source of phosphorus, and a number of farmers are testing out its value in practice by adding half-a-pint each day to the ration fed to their cows. No experimental data are yet available.

The preparation of the concentrated solution is very simple, superphosphate being thoroughly mixed with water at the rate of five pounds per gallon. On standing, the clear supernatant fluid can be dipped off as required, or decanted into another container. The residual insoluble material is discarded.

Although the saturated solution is strongly acid in reaction, it does not appear to be corrosive. Apparently a film of iron phosphate is formed on iron surfaces and this may be protective from, rather than inducive of, rusting. So far kerosene tins and galvanised buckets have been used at this Laboratory without apparent damage.

The Need for Further Experimental Work.

The data submitted in this report indicate that phosphorus deficiency is common among dairy cows in the South-West of this State. The preliminary experiments have shown that the subnormal blood inorganic phosphorus can be quickly restored to normal levels when phosphorus supplements are supplied in sufficient quantity. It remains to be shown, however, that this lift in blood phosphorus improves the health of the animals, the fertility, or the economic return to the dairy farmer. There seems no reason to doubt that the correction of an obvious blood deficiency will be beneficial and for this reason it seems that the results so far should receive publicity. Further studies are planned to follow up the interesting possibilities disclosed by this investigation.

Summary.

A preliminary report is made of observations which may prove of immediate interest to dairy farmers.

Analyses of blood samples drawn regularly over a period of fifteen months have shown that subnormal blood inorganic phosphorus levels are common in dairy cows in herds examined south of Busselton.

These subnormal values persist throughout the winter despite abundance of green mixed pasture of excellent quality.

These pastures have a better-than-average phosphorus content (0.28–0.40 per cent. P in the dry matter).

Attention is drawn to the probability that cows producing more than three gallons of milk per day cannot eat enough green herbage to satisfy their phosphorus requirements, even when the pasture is at its best.

For most of the year the herbage and meadow hay supply only enough phosphorus to meet the requirements of a two gallon cow.

It is thus apparent that phosphatic supplements must be fed *all the year* to dairy cows of any quality.

Commercial phosphatic supplements such as sterilised boneflour were found to restore the blood phosphate to normal, if fed in adequate amounts.

Pure sodium phosphate in the drinking water, at the rate of five pounds per 100 gallons, was equally effective in maintaining or restoring normal blood inorganic phosphate levels.

Because the usual phosphatic supplements are in short supply, or are expensive, the use of superphosphate in the drinking water was tested as a source of cheap, readily procurable, phosphate for direct supply to the animal.

Results are reported which indicate that superphosphate may be used in this way, five pounds of superphosphate being added to each hundred gallons of drinking water. Cows drinking ten gallons of such water receive as much phosphate as is present in six ounces of bonemeal.

Methods of supplying water treated with superphosphate are discussed. It is emphasised that the use of such water means that *all stock* receive an adequate phosphate intake during the summer months when reserves are normally depleted.

The possible use of saturated solutions prepared by thoroughly mixing five pounds of superphosphate per gallon of water, is discussed. These solutions could be used to damp down concentrates or hay.

Further experiments are planned, chiefly to determine if the restoration of normal blood inorganic phosphate levels is associated with any improvement in the health, production, fertility and growth rates of dairy cattle.

Acknowledgments.

The investigation, of which the results described in this paper form a part, was commenced in collaboration with Veterinary Surgeon Harley, who had stressed the seriousness of the problems involved and made arrangements for much of the field work. I must record my thanks to the many individual farmers who gave me help and information in the field. Particularly am I indebted to those who, month after month, at no small personal cost, have made their herds available for blood sampling and experimental work.

The routine analyses of pasture samples were carried out by the Government Chemical Laboratories.

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TREES FOR THE WHEAT BELT.

G. E. BROCKWAY, ASSISTANT CONSERVATOR FORESTS.

TO discuss the planting of trees on an extensive scale in an area such as the wheat belt of this State where there have been millions destroyed during the last half-century may seem somewhat strange. Nevertheless the planting of trees must play a large part in the future economy of our drier areas and will add to the comfort of people dwelling there.

It is obviously impossible to bring land under cultivation without clearing the natural vegetation. In the urgency of the clearing, little thought has been given to the problems which might arise as a result of this action. The uppermost thought in the settler's mind would more naturally be "when am I going to get my first crop ?" rather than " what effect will my farming methods have on the land by the time I am dead ? " From a purely personal point of view this may appear in order but nationally it can be catastrophic. Our national existence depends on our land and we cannot afford to have it ruined in a generation or two.

Mistakes of over-clearing have been made and are continuing to be made although many progressive farmers realise the necessity of repairing the damage wrought by themselves or their predecessors. There is much to repair. We have thousands of paddocks without a shade tree, thousands of farm buildings without a shelter belt, very many farmers with an inadequate firewood and timber supply and very few farms with an adequate system of wind-breaks. The stage is set for erosion on a large scale. The effects of wind erosion have already become apparent in many places in the form of partly buried fences and roads. Tree planting is not the full answer to this problem, but it is one of the several methods which, used conjointly, may effectually check it.

These are the more obvious results of indiscriminate clearing and are in many cases the result of lack of forethought. Another effect of clearing which could not be accurately forecast is the rise of the water table and the resulting rise of salt in many places.

It is not difficult to conclude that if you cut all the trees down in a district there won't be any shade trees left, but it would be practically impossible to say in absolute terms what the effect will be on the level of the water table or the salinity of the soil. While many settlers through lack of forethought destroyed valuable shade and shelter trees, others who have farmed light land have just not had any trees to destroy. Nevertheless, their need for trees is just as urgent or perhaps more so than that of the farmers on the heavier lands.

Much has still to be learned about the trees suitable for our wheat belt lands but considerable progress has been made and with the introduction of additional species able to withstand the climate of our dry areas this knowledge can be further increased very rapidly.

Our planting has up to the present time been confined to a very small list of trees such as the sugar gums, the pepper-trees (*Schinus molle* Linn), the kurrajong and more recently, the athel tree.

The sugar gum (*Eucalyptus cladocalyx*, F. Muell) is a splendid tree. It adapts itself to a wide range of sites and conditions but even so it has its limitations and may fail on shallow soils or soils which set very hard during the summer, particu-

larly in the drier portions of our wheat belt. It is easy to raise, a fast grower, of attractive appearance, but it is naturally a big tree and finds it difficult to reconcile itself to life under a telegraph line. "Tree pruners," do their best to keep it within due bounds and "sugars" planted in such circumscribed living room alternate between periods of stark ghastliness and beauty. We want other hardy street trees for our country towns.

The kurrajong is frequently a disappointment. Our own local tree (*Brachychiton Gregorii*, F. Muell) is certainly a drought resister but there has been difficulty in raising supplies of this in our coastal nursery. The introduced New South Wales kurrajong (*Brachychiton*), where it has succeeded, which is usually where it has enjoyed shelter and some extra water, has produced some excellent specimens but in the more exposed sites it is usually not a success.

The pepper-tree (*Schinus molle* Linn) does well in some sites, but in low lying clay situations where the soil bakes hard it seldom looks happy.

The athel tree (*Tamarix aphylla* Karst), a native of Northern Africa, has proved valuable on the better soils of our drier areas—particularly in the mining centres, both here and in the Eastern States. It has not yet been used extensively in the wheat belt—however it has the valuable property of being easily propagated from cuttings and if once established in a district its increase can be rapid and cheap.

With the development of a new Forests Department nursery at Kalgoorlie a new range of species is being made available the aim being to have a suitable tree for every site and every job and there appears little need to seek outside of Australia to find most of them. There seems little to be gained by even getting away from our own eucalypts which exhibit such outstanding variety of forms and shades of leaf colour, while some bear blossoms of very great beauty. Furthermore they possess that rather uncommon combination—fast initial growth and long life. Much as we might approve of the idea of planting for posterity, it is ever so much more gratifying if we have the satisfaction of enjoying the results of our labours as well.

As every farmer knows different soil types support different tree species—in fact it is not uncommon in farming circles for a soil to be described not by its physical and chemical properties but by the tree species which it originally carried.

There is a wide variety of soils in the wheat belt but some of the main broad groups are. :—

(a) The brown, red-brown and grey heavy soils originally timbered with trees such as salmon gum, gimlet, morrel and yorrel. These soils usually contain free lime and are alkaline in reaction.

(b) The brown and grey sandy or loamy surfaced soils originally carrying mallee. These soils often have alkaline clay subsoils with limestone nodules.

(c) The brown and red-brown medium textured soils with clay subsoils and which originally carried mostly york gum and jam. These soils have brown and red-brown clay subsoils usually without lime and are more or less neutral in reaction.

(d) The scrub plain and sandplain soils. These are grey to yellow in colour, sandy and often more or less gravelly. They are acid in reaction.

For the heavier and more alkaline soils of groups (a), (b) and (c) the range of suitable species includes some fine trees. The salmon gum and gimlet are well known but there are others of great promise, the most outstanding being Dundas Blackbutt

(*Eucalyptus Dundasi*) Dundas mahogany (*Euc. Brockwayi*) Merrit (*Euc. Flocktoniae*). and River Gum (*Euc. camaldulensis*). Planting carried out on heavy soils on the goldfields during the last three or four years with these and other species have given encouraging results.

Most of the trees suitable for the acid scrub plain soils will also grow on the better soils but the reverse is not necessarily the case. For the deep sands the sugar gum cannot be dismissed lightly but it has a number of possible companions and of these perhaps the most worthy of consideration are *Eucalyptus* Woodwardi, *E. camaldulensis* as large trees with several of the smaller trees or mallees to add variety, e.g. *E. Stoatei*, *E. Burracoppinensis* and *E. ebbanoesocnsis*.

On the more gravelly portions of the scrub plains wherever the soil is shallow or tends to set hard the sugar gums are liable to fail and something hardier may fill the bill, possibly *E. Stricklandi* (if a tree with a shiny leaf is required), *E. torquata* (a good shade tree with beautiful blossoms) or *E. astringens* (a good shade tree producing a valuable tan bark and a fine tough timber.).

Saline Areas.—The tree with the greatest ability to stand up to salt appears to be *E. Sargenti* but observations of this species indicate that it is very subject to borer attack and other possible species which might be mentioned are *E. occidentalis*, *E. Brachycorys* and *E. gracilis*. *Casuarina glauca* cannot be left out of the list.

Sugar Gum (*E. cladocalyx*, F. Muell)

Methods of Direct Sowing.—While trees can be established by direct sowing (spot sowing) as is done in the Forests Department's mallet plantations, this method requires favourable conditions both from the point of view of soil and of climate. Moreover, plenty of seed is required. While this method has been found suitable in a 20 inch rainfall for the establishment of trees of one species at least (brown mallet) in plantations, it could not be recommended in the lighter rainfall areas or for such purposes as the establishment of windbreaks or avenues where the whole effect could be spoiled by failures in a few spots. Literature on tree establishment by this method is available from the Forests Department.

2. *Planting of trees obtained from the Nursery.*—Two methods are recommended :

(a) For establishment under field conditions where cultivation by farm machinery is possible.

(b) For establishment as isolated ornamental trees or in such situation e.g. in street planting where machine cultivation is not possible.

(a) *Establishment under field conditions.*

For some years a progressive farmer in the Narembeen district (average annual rainfall about 13 inches) has been establishing belts of trees by a particularly practical method similar to that used in the Victorian wheat areas although I understand that he arrived at it quite independently. This method entails briefly :—

(1) The ploughing and fallowing of the land for twelve months prior to planting.

(2) Fencing to exclude stock and rabbits.

(3) Planting during early winter (this differs from the Victorian practice of late winter or spring planting where tube grown trees are used instead of pot grown trees.

(4) Watering (about one gallon per tree) at the time of planting but no further watering subsequently.

(5) Cultivation between the rows shortly after planting and then at intervals for the next two years to keep surface free of weeds.

(6) The chipping of weeds from around the trees with a hoe where they cannot be reached by the cultivator.

(b) *Establishment of isolated trees, ornamental trees, street trees, etc.*

These cannot be given the cultivation recommended above and periodic watering is advisable for one or more years after planting.

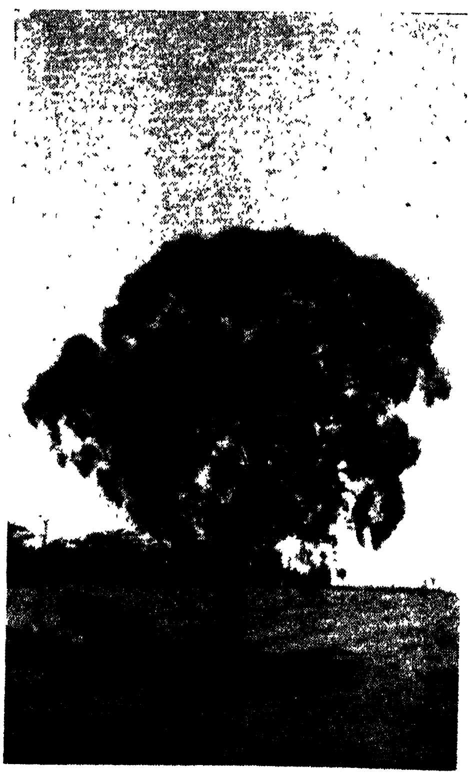
Planting should be done in the early winter—preferably June but not later than August.

Positions for the trees should be selected where they will have ample room for development and will not be robbed by adjacent trees and shrubs. An area three or four feet in diameter should be cleared of all debris, worked to a depth of about eight inches and hollowed into a saucer shaped depression about five inches deep—in the centre of which the tree is planted. Where the ground is rocky it is sometimes found advisable to break it up with explosive.

Watering at the time for planting is advisable and thereafter at intervals as required. During the first summer watering once per week may be necessary but after this at less frequent intervals. Waterings should be heavy enough to ensure that the water soaks well down. Frequent light waterings which just moisten the top ultimately do more harm than good.

Furthermore, the planter must be prepared to take the requisite steps to ensure that there is no growth of weeds around the young tree. There is possibly no more frequent cause of loss than the over-running of the young trees by rank weed growth.

Details of Planting Methods.—Trees as received from the nursery are usually from nine to twelve inches high. A small healthy tree is to be preferred to a large spindly one which may put too much of a drain on the confined root system. When received trees have their roots enclosed in a cone of earth either in a pot or already removed from the pot. Trees should be examined as soon as they are received and if the soil in which they are established is at all dry, they should be watered. Watering should be closely attended to up till the time of planting. Many plants are received in good condition but are lost through drying out between the time the purchaser gets them and the time when he finds it convenient to plant them. If they are still in pots do not try to take them out without a thorough soaking. When thoroughly soaked the pots can be turned upside down and if the edge is sharply tapped on a rail or some other solid object, the earth will come away cleanly. Naturally the free hand must be held so as to support the cone of earth as it is freed from the pot.



Yorrel (*E. gracilis*)

Care is necessary to make sure that the cone of earth is not broken as most of our Eucalypts cannot stand having their roots damaged, but if as is often the case there is a coil of roots at the bottom of the cone these can be gently uncoiled and the planting hole deepened to take them.

It is advisable to be very sparing with manure at the time of planting. The native trees grow naturally in our soils without it. What manure, if any, is given should be well mixed with the soil and if of animal origin, should be well rotted before being applied. A mulch of grass, leaves or old rotted manure around the tree will check drying out.

Trees should be planted in damp soil so that the surface of the piece of soil in which they are received is covered to a depth of about one inch. Soil should be pressed around them to insure that all air pockets are removed and after pressing the soil loosely into place with the fingers a further pressing with the sole of the planter's boot, not too close to the tree, is advisable—after that watering should then be given.

If carefully planted in well prepared soil, the trees soon start to make new growth. Some planters endeavour to encourage rapid height growth by pruning off all of the side shoots. This usually results in a spindly plant which cannot support its own weight and requires continual tying up to supporting stake. It is advisable to prune as little as possible. The leaves constitute the food producing mechanism of the plant and their removal cuts down the food ration of the young tree. It will be found that as the tree develops the lower twigs having served their purpose of helping to feed the tree and protect the ground and young stem, will drop off in their own good time. If, when the tree is two or three feet high it is seen to have developed two main stems, one can permissibly be removed.

As most trees planted in the wheat belt will be in rather exposed situations and will lack the lateral protection enjoyed by trees growing under natural conditions, it is essential that they be allowed to develop sturdily to enable them to withstand heavy wind.

A slight variation in planting method is sometimes employed. This entails the holding of plants for twelve months in larger containers such as kerosene tins or old sanitary pans—instead of planting them direct into the soil when they are received from the nursery. For street planting in built up areas this method has much to commend it. At the end of this second year the trees should be four or five feet high. With careful planting and subsequent attention losses are negligible. While cases of theft and vandalism are not uncommon with small trees a few inches high, these larger trees provided they are protected by a guard do not suffer to the same extent.

In holding trees for this extra year certain precautions must be taken viz.,

(1) See that the containers have ample drainage holes—preferably at the bottom of the sides. By placing them thus the roots are less likely to get through into the soil below. If this should happen the cutting of the roots at planting time may prove fatal—some planters recommend that the bottom of the container be almost cut out—leaving a few small supporting strips which can be cut at planting time.

(2) As an additional precaution containers should be stood on supports a couple of inches high to prevent roots passing though into the soil below.

(3) To prevent the trees becoming too spindly, tins should be spaced about nine inches or a foot apart.

(4) Refrain from pruning except to correct a mis-shapen form or growth.

(5) Water at least two or three times a week. If allowed to become too dry, quite apart from the danger of losing the tree, there is a chance that through the shrinkage of the earth in the container, the next watering will run down between the container and the earth it contains and the tree will derive little benefit from it.

(6) At time of planting a hole deep enough to take the large block of earth in which the tree is established should be dug. The bottom should first be cut out of the container and the whole lot placed in the hole and then a cut put down the side of the container so that it can be removed.

(7) *Filling of the hole*—Watering and light tamping of the earth at time of planting as previously described is necessary.

Correct planting methods will be of little avail if the selection of species is unsatisfactory. Height, habit of growth and appearance are all factors to consider in relation to the purpose for which the trees are planted.

While Eucalypts are in most cases adaptable as to their soil requirements, it is advisable not to place too great a strain on their adaptability—but to plant trees from soil types similar to those to be planted. The Table at the end of this article should be referred to as a guide in these matters.

Spacing of trees.—An observer examining a thicket of gimlets which have grown up under natural conditions with close spacing will notice that very few, if any trees, possess a good shady crown. However a tree of the same species which has grown up in a more isolated position will usually be found to have a larger denser crown and incidentally to have attained a greater size than the more crowded specimens. This unfavourable effect of over-crowding is particularly marked under conditions where the amount of moisture available in the soil is small. The lesson is obvious ; don't plant trees too closely together, particularly those planted for shade or ornament.

Except in the case of the smaller trees, it is inadvisable to plant closer than about twenty feet apart, although if only one row of trees is planted, slightly closer spacing might be permissable as the tree roots can spread out on either side of the row.

One row of trees cannot be considered very effective as a wind-break under dry area conditions. The effectiveness of a wind-break, assuming it is in the right strategic position in relation to the area to be protected, depends on two main factors, viz., height and density.

Most of the trees which grow tall, have long slender trunks and a lot of wind can pass underneath them. It is advisable therefore to plant a row of more dwarf trees to take the first brunt of the prevailing wind and behind these one or two rows of the tall trees. The dwarf trees tend to break the force of the wind and deflect it in an upward direction and the taller trees behind continue this upward lift. *A good windbreak is considered to afford protection for a distance equivalent to ten times its own height.*

Something more than a strip of uncleared sand plain scrub is needed to protect an area of clearing.

Protection.—While protection from rabbits is necessary only for a couple of years, protection from domestic animals is required for a longer period. Cattle particularly may do considerable damage to trees while stock fed solely by hand on chaff and succulent green feed will frequently chew the bark from young succulent trees.

Above all, make certain that trees are protected from fire. This is the greatest enemy of our inland species and failure to take the required precautions in this direction may result in the death in a few minutes of trees which have taken years to establish.

Gimlet (*E. salubris*)

DESCRIPTION OF TREES RAISED (MOSTLY IN 3 in. POTS)

FORESTS DEPARTMENT, KALGOORLIE

Genus and Species	Height when Mature	Description	Purpose for which recommended	Soil requirements	Remarks
	feet				
Salmon Gum, *Eucalyptus salmonophloia*, F. Muell	80	Bark—smooth, salmon-coloured. Crown—umbrella, fairly dense. Leaves—small, bright green, shining. Blossoms—white, inconspicuous	Shade tree, avenue windbreak	Medium to heavy loam	Develops into splendid tree if not crowded.
Gimlet, *E. salubris*, F. Muell	40	Bark—smooth, bronze-coloured. Crown—umbrella. Leaves—small, shining, medium dark green. Blossoms—white, inconspicuous	Shade tree .	Heavy loam . .	If planted too close trees become spindly.
Silver Gimlet, *E. campaspe*, S. Moore	35	Bark—smooth, bronze coloured. Crown—umbrella. Leaves—small, silvery-green. Blossoms—white, inconspicuous	Shade tree, street planting	Fairly adaptable, light to heavy loam	Good drought resistant.
Dundas Mahogany, *E. Brockwayi*, C. A. Gardn	80	Bark—smooth, pinkish-grey. Crown—fairly dense umbrella. Leaves—long and dark green, shining. Blossoms—white, inconspicuous	Shade tree, windbreak	Medium loam . .	Similar to Salmon Gum but grows faster when young.
Dundas Blackbutt (Coffee Gum), *E. Dundasi*, Maiden	50	Bark—at butt dark and rough, limbs smooth and coppery. Crown—fairly dense. Leaves—dark green, shining. Blossoms—white, inconspicuous	Good shade tree, street tree or windbreak	Medium loam . .	Splendid all purpose tree.
Goldfields Blackbutt, *E. Le Souefii*, Maiden	40	Bark—rough at butt, smooth grey limbs. Crown—umbrella, generally slightly open. Leaves—mid-green, slight sheen. Blossoms—cream, inconspicuous	Shade tree for poorer soils	Sand or loam with or without gravel	Is often found in poor gravelly soils

Yellow-flowered Blackbutt, *E. Stricklandi*, Maiden	35	Bark—rough at butt, smooth grey limbs. Crown—in young trees pyramidal. Irregular on old trees. Leaves—long, leathery, dark green, shining. Blossoms—yellow, rather striking	Shade tree for poor soils	Laterite soils or loam	A good drought resistant, hardy tree.
Coral-flowered Gum, *E. torquata*, Luehm	35	Bark—dark, rough. Crown—fairly dense, globular. Leaves—small, dark, very little sheen. Blossoms—pink, rather striking, bright red calyx	Street tree, windbreak, shady and ornamental	Fairly adaptable, laterite or loams	Grown extensively at Broken Hill. Deservedly popular.
Merrit, *E. Flocktoniae*, Maiden	50	Bark—smooth, silvery-white. Crown—pyramidal. Leaves—small, very dark, shining. Blossoms—yellowish, pretty but not outstanding	Good general purpose tree	Sandy loam	Very ornamental tree, good for avenue planting
Boongul *E. transcontinentalis*, Maiden	50	Bark—smooth, silvery-white. Crown—umbrella but irregular. Leaves—Bluish-green, not shining. Blossoms—yellowish, pretty but not outstanding	Good general purpose tree	Sandy loam	Good hardy shade tree
Morrell, *E. longicornis*, F. Muell	70	Bark—rough grey. Crown—umbrella. Leaves—small, medium dark, shining. Blossoms—white, inconspicuous	Good shade tree	Medium to heavy loams	Good tree for planting on fluid soils near lakes.
Ribbon Gum, *E. brachycorys*, Blakely	40	Bark—smooth, silvery white. Crown—umbrella. Leaves—medium green, not much sheen. Blossoms—white, inconspicuous	Shade tree for lake country	Sandy loams, sand ridges near lakes	Fairly resistant to salt.
River Gum, *E. camaldulensis*, Dehn	60	Bark—smooth, white and greyish. Crown—branches droop somewhat. Leaves—pale green, not much sheen. Blossoms—white, inconspicuous	Good shade tree . .	Adaptable all loams	Good rapid-growing drought - resistant tree. May require supporting while young.
White Mallet, *E. falcata*, Turez	50	Bark—smooth white. Crown—rather bushy Leaves—mid-green, shining. Blossoms—inconspicuous	Good all purpose tree	Adaptable sandy loams, laterite, etc	
Brown Mallet, *E. astringens*, Maiden	....	Bark—smooth, bronze. Crown—rather bushy. Leaves—bluish, rather dull, small. Blossoms—inconspicuous	Good all purpose tree	Adaptable sandy loams, laterite, etc.	Produces mallet bark of commerce.

DESCRIPTION OF TREES RAISED (mostly in 3 in. pots)—*continued.*

Forests Department, Kalgoorlie—*continued.*

Genus and Species	Height when Mature	Description	Purpose for which recommended	Soil requirements	Remarks
	feet				
Blue Mallet, *E. Gardneri*, Maiden		Bark—smooth, greyish. Crown—rather bushy. Leaves—bluish-green, rather large. Blossoms—inconspicuous	Good all purpose tree	Adaptable sandy loams, laterite, etc.	
Pear Gum, *E. Stoatei*, C. A. Gardn	35	Bark—white grey, smooth. Crown—pyramidal. Leaves—dark green, small, leathery, Blossoms—yellow on large red calyx, striking	Ornamental ...	Adaptable sand to medium loam	Small ornamental symmetrical tree. Good for large garden, etc.
Wandoo, *E. redunca*, Schau *var. elata*, Benth	60	Bark—white and grey, smooth. Crown—umbrella. Leaves—bluish-green, rather dull. Blossoms—inconspicuous	Shade ...	Adaptable loam sand or laterites	
Lemon-flowered Gum, *E. Woodwardi*, Maiden	45	Bark—white, smooth. Crown—small branches droop. Leaves—pale blue-green with powdery white surface. Blossoms—rather beautiful, large, yellow	Ornamental	Deep loamy sand or loam	Hardy drought-resistant.
E. Kruseana, F. Muell	25	Bark—coppery, smooth but flaky. Crown—pyramidal later becoming irregular. Leaves—very small, sessile. Blossoms—yellowish-green—like bottle brush	Ornamental	Loamy sand and loams	Good for use as ornamental tree in garden
E. ebbanoensis, Maiden ...	30	Bark—smooth bronze-coloured. Crown—umbrella, rather dense. Leaves—medium green but black sheen. Blossom—white, inconspicuous	Good shade tree	Loamy sand	Hardy, drought resistant.
Yorrel, *E. gracilis*, F. Muell	40	Bark—rough at butt, limbs smooth coppery. Crown—bushy when not crowded. Leaves—dark green, shiny. Blossoms—white, inconspicuous	Street planting, shade tree, windbreak	Light and medium loams in lake country	Makes splendid shade tree and should be popular

***E. intertexta*, R. T. Baker**	60	Bark—butt grey and rough, limbs smooth white. Crown—irregular. Leaves—bluish-green, rather dull.	Street planting, shade tree, wind-break	Sandy loams, etc. ...	**A New South Wales tree. Very hardy. Rather like Boongul.**
Sugar Gum, *E. cladocalyx*, F. Muell	70	Bark—greyish, smooth. Crown—rather bushy. Leaves—dark green, slight sheen. Blossoms—cream, inconspicuous	Good all purpose tree	**Best in light soils provided they do not set hard in summer**	**Well-known tree. Not recommended below 16 inch rainfall.**
Redwood, *E. oleosa* F. Muell	30	Bark—rough grey. Crown—umbrella. Leaves—dark green, fair sheen. Blossome—cream, inconspicuous	Shade tree .	Light sandy loam. .	**Very hardy drought-resistant.**
Flat-topped Yate, *E. occidentalis* Endl.	70	Bark—Rough and dark grey on trunk but smooth on limbs. Umbrella crown, leaves large and shining. Blossoms—yellowish white	Shade tree	**Low lying sandy soils**	**Useful for swampy areas.**
Salt River Gum, *E. Sargenti* Maiden	30	Bark—Rough and grey on trunk. On limbs, smooth or ribbony and brown in colour. Crown umbrella—leaves small and rather dull	Shade tree ..	Low lying salty situations	**This tree is sometimes subject to borer attack.**
Native Cypress or Native Pine (New South Wales), *Callitris glauca* (R.Br.) Mirb.	70	Bark—dark grey, rough and hard. Crown—pyramidal. leaves small and cypress-like, bluish-green in colour. Bears small cones, no flowers.	Ornamental	Deep loamy sand	Hardy, drought-resistant. Rather a slow-growing tree.
Native Willow, *Pittosporum phillyraeoides* D.C.	20	Bark—smooth, light grey. bushy top with drooping branchlets, leaves are dark green and narrow, flowers are small, white and inconspicuous. Seed capsules—bright orange coloured	Ornamental. Good small shade tree	Sand to medium loam	**Rather a slow-growing tree and only recommended for ornamental purposes.**
Athel Tree, *Tamarix aphylla* Karst	50	Bark—dark grey, rough. Crown—bushy and dense leaves, small, rather like those of a sheoak. Flowers—cream in colour and rather inconspicuous	Ornamental, wind break, firewood	Adaptable as to soils, but appears to prefer the richer soils	**Advisable to grow from cutting as once rooted it transplants badly. Hardy, drought-resistant, fast-grower.**

COMMUNICATION BETWEEN HONEY BEES

R. S. Coleman—Acting Apiculturist.

An address given to the Bee-Keepers' section of the West Australian Farmers' Union the 12th July, 1949.

MOST of us, at sometime or another, have wondered if bees can communicate with each other and if they do, how much information they can pass on, but while we can make shrewd guesses there it ends. Fortunately there is a man who has and is still working with his considerable knowledge and intellect on this problem, and most of us have had contact with his work in some way or another.

This man's name is Prof. Karl von Frisch, an Austrian of the Graz University. He himself, with his co-workers, students and ex-students have given us information on many aspects of bee behaviour.

Firstly, he proved that bees can differentiate between the colours, which while guessed at before, had never been proved, the only exception being that bees are blind to red. The colours he used were blue, orange, yellow, green, violet and purple. (Ref. 1.)

Secondly, from his work was also discovered that bees may see colours beyond the range of the human eye; in other words they may be able to perceive infra red and ultra violet rays. (Ref. 1.)

Thirdly, Dr. Beling, an ex-student of Prof. von Frisch, found that bees have a time sense in that they will visit a spot at a certain time if they are used to being fed there at that time. (Ref. 1.)

Fourthly, Prof. von Frisch also discovered that bees have a taste sense, and he experimented with 34 sugars, 30 of which are sweet to us and nine proved sweet to the bees. (Ref. 1.)

Fifthly, Prof. von Frisch and his co-worker, G. A. Rosch, determined the duties of bees in relation to age—such as (in order of age) cell cleaning, feeding of older larvae, feeding of younger larvae, house-keeping duties, guard duties and field work. (Ref. 1.)

In 1920-23 Prof. von Frisch worked upon "Communication between Bees." He came to the conclusion that a dance, which he called the tail wagging dance, was an exhortation to neighbouring bees to go and collect pollen of the type which was in the dancing bees' "pollen baskets." Also he reported that the "round dance" was an exhortation for the other bees to go and collect nectar of the odour which the dancing bees exuded from their honey crops. These dances were proved to be used, only when new food was available, to get more gatherers for the job.

Prof. von Frisch was induced to resume his studies on "Communication between Honey Bees" in 1944 and from these experiments he discovered that he had made a mistake in the interpretation of his results in 1923 in that the "waggle" and "round" dances are not words in the bee language for different types of food but show the distance, direction, amount and kind of food to be picked up.

How he, step by step with repeated experiments, found and proved his deductions I will not trouble you, but his results and the language of the bees so explained are well worth relating.

Prof. von Frisch first found his own mistake in that he thought bees searched all the area around their hive, for either pollen or nectar, gradually spreading out. The reverse was found to be true. The bees, rather go to the spot where the food is to be found and spread out from there. This result made him realise the possibility of the bees giving an indication of the spot where food may be found, for he had eliminated the use of the scent organ to guide the bees. He then discovered that the waggle and round dances were indications of distances, not words meaning pollen and nectar.

In the round dance (Fig. 1) the bee dances clockwise and anti-clockwise in quick succession; the diameter of the circle is usually less than two cells and from a quarter of a circle up to two complete circuits may be danced before changing direction. The bees with this dance indicate that the food is close to the hive, saying in effect "look around near to the hive for the type of food I collected." As the distance to the feeding place increases, the round dance melts into the tail wagging dance.

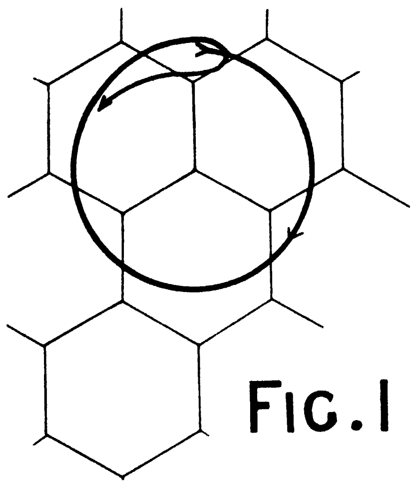


FIG. 1

However, before going on, it is best that the tail wagging dance (Fig. 2) be explained first. In this the bee, from a point runs in a semi-circle and when opposite the starting point runs across the circle wagging the tip of her abdomen, she then runs around the opposite semi-circle, repeats the tail wagging run again and so on.

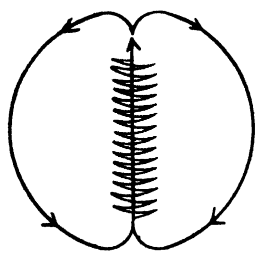


FIG. 2

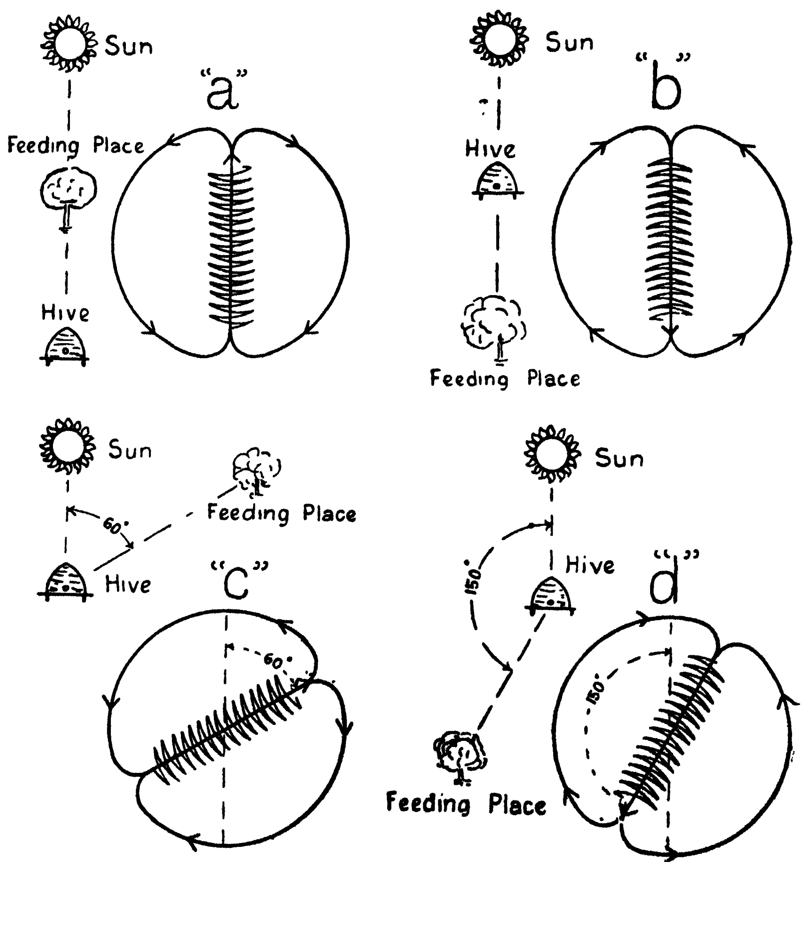
To go back to the story of the round dance. As the distance from the hive increases so do more of the tail wagging movements appear. Usually the first definite movement appears in the dance at 50 metres. Between 50 and 100 metres there is an almost complete change over. The bees at 100 metres

do a definite tail wagging dance, but occasionally a bee will interpose a complete circle. At 150 metres, a very occasional bee, will put a circle into her tail wagging dance. From 200 metres, however, only the wagging dance appears. On the discovery of this much, Prof. von Frisch reasoned that it was biologically improbable that the information passed from the dancing bee to her co-workers stopped at near to the hive and far away from the hive.

In 1945 he continued his experimenting and found that bees do communicate over 200 metres and still do to the limit of their flight range by the number of times the tip of the abdomen is moved in a run, or the length of time taken to make a complete run. The movement of the tip of the abdomen, is too fast for accurate counting with the human eye. A slow motion cine-camera would be the only answer. Therefore, time taken for a complete run was the only factor which could be measured by the professor. From his observations to give only two of many results Prof. von Frisch found that bees average seven to eight runs per 15 seconds with the feeding place at 200 metres and at 1,500 metres the bees average four runs per 15 seconds.

I believe the professor can with a stop watch in hand, gauge very accurately the distance a bee has returned with her load of nectar or pollen.

FIG. 3



The next problem which arose was the puzzle "did bees inform each other of the necessary direction to take to reach the food?" They could lay a scent track in the air, that seemed improbable but Prof. von Frisch by sealing the fifth and sixth segments together and by choice of location proved that the bees certainly had some other means of communicating direction to each other. The means of showing the direction of food proved to be the run of the waggle dance.

When resuming his experiments in 1945 Prof. von Frisch noticed that bees from a particular feeding spot always ran in the same direction and this direction changed during the day. The bees proved to be using the sun as a land mark for the others to steer by.

"The direction of the dance on a vertical comb bears a definite relation to the position of the sun. Thus a waggle dance upwards indicates that the food source lies in the direction of the sun. A waggle dance downwards indicates a feeding place in the opposite direction. A waggle dance to the right means that the food source is to be found to the right of the sun and at such an angle to the right by which the waggle dance deviates from the vertical. A waggle dance to the left indicates a feeding place at a corresponding angle to the left of the position of the sun."

The professor found this angle to be surprisingly accurate, very seldom out more than one degree and with the same result no matter which way the entrance is faced.

Another fact that is almost unexplainable—bees on the dullest days, with very thick clouds, can indicate direction relative to the sun as accurately as on the sunniest of days.

The next amazing thing, then discovered was that the bees can, without any pause, when the comb is turned to a horizontal position change from this business of indicating the direction in relation to the sun, to indicating the actual direction as if the bee herself had a compass in her body pointing towards the food.

So now we know how the bees communicate to each other about firstly, the kind of food by regurgitating nectar from their honey crop or dancing with pollen bag, which gives the odour of the flower.

Secondly, about the amount of food available in proportion to the number of collectors by the vigour of their dances.

Thirdly, the distance of the food from the hive is shown by the form of the dance.

Fourthly, direction is shown by the direction of the run in the tail wagging dance. Shown by round dance up to 50 metres, waggle dance from 100 metres and the length and speed of the runs of the waggle dance over 200 metres distance.

Prof. von Frisch is continuing his researches and I believe there is another paper, not yet to hand, showing how this knowledge about the language of bees can be used for leading bees to certain flowers when the more complete pollination and nectar-gathering will give an increase in an orchard crop or in a surplus of honey.

(This article, where not definitely shown, was subtracted from "The Bulletin of Animal Behaviour No. 5." by K. von Frisch, translated by W. H. Thorpe and Miss Erika Grossfield.)

Ref. (1) A.B.C. and X.Y.Z. of Beekeeping by A. I. Root.

STOCK FOODS.

The following Stock Foods have been registered at the Department of Agriculture under the Feeding Stuffs Act, 1928-46 for year commencing 1st July, 1949.

Stock Foods.	Reg. No.	Brand	By whom Registered	Materials from which Made	Registered Analysis: Crude Protein	Crude Fat	Crude Fibre	Sodium Chloride	Phosphoric Acid (P_2O_5)	Lime	Other	
					% (Min.)	% (Max.)	% (Max.)	% (Max.)	%	% Ca (Max.)		
1.—Meat Meals.												
Meat Meal	27	"COOGEE"....	Anchorage Butchers, Pty., Ltd.	Waste meat products . . .	36·9	18·6	1·3	1·0	Max. 12·73	12·5	. .	. .
Meat Meal	29	WAME	The W.A. Meat Export Works	Meat, bone and blood	45·0	13·00	2·00	....	....	...	....	...
2.—Meat and Bone Meals.												
Meat and Bone Meal	18	EXCELSIOR...	Barrow Linton & Co.	Meat and bone	38·00	15·00	1·5	.	P_2O_5		...	....
Bone and Meat Meal	35	KITCHENS'	J. Kitchen & Sons, Pty., Ltd.	Animal Fat—bone	40·00	11·00	2·5	..	14·00	..	...	....
Protein Meat and Bone Meal	42	"CHAMPION"	SimsCooper (Aust.), Pty. Ltd.	Meat works offal .. .	50·00	12·00	5·00	.	....		..	..
Meat and Bone Meal	125	TB & S (in diamond), No. 1	Thomas Borthwick & Sons (Aust.), Ltd.	Annimal offal	35·00	20·0	3·00		...	...	..	...
3.—Blood Meals												
Blood Meal ...	128	T B & S (in diamand)	Thomas Borthwick & Sons (Aust.), Ltd.	Animal blood	75·0	5·0	5 0	....	. .		...	
4.—Fish Meals												
Fish Meal	126	T B & S (in diamaond, No. 2	Thomas Borthwick & Sons (Aust.), Ltd.	Fish offal *ex* Processing Works	53·0	12·0	3·0	....	....		..	..
Do.	127	T B & S (in diamond, No. 1	Thomas Borthwick & Sons (Aust.), Ltd.	Fish offal *ex* Processing Works	38·0	15·0	3·0	..	..	...	...	....
5.—Milk Foods												
Dried Buttermilk Powder	22	"S U N N Y WEST	South West Co-op Dairy Farmers Ltd.	By product of butter manufacture	32·1	5·7	...	....	....	CaO	Lactose	Soluble Carbohydrates 43·9
Krafco	24	KRAFCO ...	Kraft Walker Cheese Co., Pty., Ltd.	Prepared from whey derived from milk in manufacture of cheddar cheese	10·0	0·5	....	....	1·0	0·7	68·0	....

										Ca.		
6.—Wheat and Wheat By-products												
Wheat Meal	11	MILLERS	W. H. Milne & Co.	Crushed wheat	8·0	....	5·0	....	....	....	....	....
Sub-Bran	12	do.	do. do.	do. do.	8·0	....	9·0	.	..	..	....	....
Stock Meal ...	13	do.	do. do. ...	do. do.	8·0	....	9·0	..	...	....	...	....
Wheaten Meal...	56	"C" MEAL	W. Thomas & Co., (W.A.), Ltd.	Wheat	8·0	....	10·0	...	..	....	....	....
Do. do.	57	BRANATO ...	do. do. do.	do.	8·0	...	10·0	..	...	....	....	....
Do. do. ...	58	POLLATO ..	do. do. do.	do. . ..	8·0	....	10·0		..	....	....	..
Roller Bran	104	WESFARMERS	Westralian Farmers Co-op Ltd.	Wheat	8·5	....	9·0	.	...	....	....	....
Wheat Meal	105	do. ...	do. do. do.	do.	8·5	1·0	3·0	.	.	....	....	...
7.—Oil Seed Meals												
Lin Meal ..	77	WESTERN .	David Gray & Co., Pty., Ltd.	Linseed meal, yeast, malt, Bone meal, pollard, limestone	20·0	7·0	5·0	1·0		0·8	.	.
Pure Linseed Oil Meal	83	MEGGITTS	Elder Smith & Co., Ltd.	Pure linseed from which proportion of the oil has been extracted by mechanical pressure	30·0	4·0	10·0	...	.	...	..	...
A.—COMPOUND FOODS												
1.—Protein Meals												
Protein Concentrate	17	"EGGOLEEN"	Barrow Linton & Co. ...	Meat meal, cereals and minerals	37·5	Max. 12·0	1·5	6·0		4·0	....	....
Poultry Pusher ...	31	PANNIFEX	Wrights, Ltd.	Barley brannings, oats and rice brannings, pollard, bran, flax linseed, bols refuse, rape seed meal, bone and meat meal, blood meal, wheat polishings	32·0	Min. 7·0	8·0	Trace		Trace		..
Egg Milk	49	THOMAS .	W. Thomas & Co., (W.A.), Ltd.	Butter milk powder, albumen milk powder, ground limestone, salt	18·0	5·0	4·0	3·5		15·0	...	..
Quick Lay .	54	do. ..	do. do. do.	Meat meal, blood meal, liver meal, fish meal, milk powder, ground limestone, salt	35·0	Max. 12·5	4·0	6·0		15·0	.	.
Quickgrow .	55	do. .	do. do. do.	Meat meal, milk powder, ground limestone, salt	30·0	12·5	5·0	8·0		15·0	.	.
Protein Meal "A"	95	WESFARMERS	Westralian Farmers Co-op., Ltd.	Meat meal, butter milk, maize meal, fish meal, (when available), ground limestone, salt, manganese sulphate	35·0	Min. 8·0	4·0	2·5		4·0	.	..
Protein Meal "B"	96	do.	do. do. do.	Meat meal, bone meal, liver meal (when available), fish meal (when available), ground limestone	35·0	7·0	4·5	2·5	.	7·0	.	..
Westrade PVM	122	WESTRADE PVM	Westralian Trading Co.	Meat meal, peanut meal, sterilised bone flour, linseed meal, sorghum, rice and wheaten pollards, cocoanut meal	25·0	7·0	10·0	3·0	†6·0	....		

† as Tricalcic phosphate.

STOCK FOODS—*continued.*

Stock Foods.	Reg. No.	Brand	By whom Registered	Materials from which Made	Registered Analysis: Crude Protein	Crude Fat	Crude Fibre	Sodium Chlor-ide	Phos-phoric Acid (P_2O_5)	Lime Ca	Other	
					% (Min.)	% (Min.)	% (Max.)	% (Max.)	%	% (Max.)		
2.—CATTLE FOODS Cow Food	14	"DAIRY FOOD"	Barrow Linton & Co. .	Wheat, oats, barley, pea meal	9·0	2·5	6 0		....	.. .	....	....
Sweet Dairy Food	43	THOMAS	W. Thomas & Co., (W.A.), Ltd.	Bran, pollard, wheat meals, wheat germ, meat and liver meals, cocoanut meal and/or malt combings, molasses, limestone, salt	14·0	1 5	8·5	2·0	...	4·0	....	....
Sweet Dairy Food	75	WESTERN ...	David Gray & Co., Pty., Ltd.	Wheat meal, oat meal, barley meal, mill offal, linseed meal, flax meal, bone meal, yeast malt, limestone, salt	12·0	3·0	10·0	1·0	....	0·8	....	....
Sweetened Dairy Meal	99	WESFARMERS	Westralian Farmers Co-operative, Ltd.	(Wheat, oat, linseed and bone meals) clover pollard, molasses, ground limestone, salt, blue stone	11.0	2.5	6.0	1.0	..	1.0	Copper .003	..
2. *Calf Foods.* Calf Milk	52	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Butter milk powder, cocoanut meal, blood meal, pollard, ground limestone, salt	17.0	2.5	6.0	2.0	.	10.0	....	....
Calf Food .	53	do.	do. do. do.	Linseed oil meal, meat meal, pollard, ground limestone, salt	20 0	2 5	8 0	3.0	.	10.0	....	..
Do.	66	VETAMAC	A. H. McDonald & Co.	Wheat pollard, maize meal, linseed meal, milk sugar, mutton bird oil	15.35	7 5	1 5		.		....	....
Do.	67	PARSONS .	Parsons Bros. & Co. Pty., Ltd.	Wheat, oat branning, linseed, ground limestone, salt	12 0	2.0	6.0		.	.	....	....
Do. ...	76	WESTERN ..	David Gray & Co. Pty., Ltd.	Pollard, linseed meal, milk powder, yeast, malt, bone meal, limestone	20.0	7.0	5.0	1.0		0.8	....	....
Do. .	82	HARPERS STAR	Robert Harper & Co.	Oats, linseed, maize, barley and rice meals, condiments	12.5	12.5	6.00	. .	. .	. .	....	....
Calf Meal ..	100	WESFARMERS	Westralian Farmers Co-operative, Ltd.	Wheat, barley, maize, linseed and bone meals, butter milk*, whey powder, ground limestone, salt, copper sulphate	13.0	3.5	6.0	1.0	. .	1.0	....	....
Calf Food	131	EVE-LYN ...	Tropical Traders, Ltd. ..	Wheat, pollard, linseed (whole), salt, sugar, chalk, sulphur, tumeric, sodium bicarbonate, cream of tartar, founergreek, ginger, coriander, copper sulphate (trace), bole armenian	8 5	3.0	3.86	3.5		....	Sulphur 1.75	....

4. *Sheep Foods.*												
Maintenance Sheep Nuts	72	WESTERN	David Gray & Co. Pty., Ltd.	Linseed meal, yeast, malt, bone meal, wheat meal, salt, limestone, trace elements	15.0	3.0	7.0	1.0	..	0.8	.	....
Ewe and Lamb Nuts	74	do.	do. do. do.	Linseed meal, yeast, malt, bone meal, wheat meal, salt, limestone, trace elements, wheat germ	20 0	5.0	5.0	1.0	.	0.8	...	...
Sheep Breeder Cubes	101	WESFARMERS	Westralian Farmers Co-operative, Ltd.	Oat, wheat, barley, linseed, *peanut and *cocoanut meals, bone meal, clover pollard, molasses, limestone, salt, minerals	18.0	3.0	7.5	1.0		1.0	.	...
Sheep Maintenance Cubes	102	do.	do. do. do.	do. do. do.	14.0	3.0	7.5	1.0	.	1.0	...	....
4. *Poultry Foods.*												
Fattening Mash	7	MILLERS	W. H. Milne & Co. ...	Bran, pollard, wheatmeal grist, oats, meat meal, bonemeal, salt	12 0	4.0	6.0	1.5	2.0	3.5	...	....
Laying Mash No. 1	8	do.	do. do.	Bran, pollard, wheat meal grist, oats, meat meal, bone meal, salt, limestone	14.0	4.0	5.5	1.5	2.0	3 0		..
Laying Mash	16	EGGLAYER	Barrow Linton & Co.	Bran, pollard, wheat meal, oat pollard, meat meal, salt, limestone	16 0	3.5	4.5	1 0		3 0	.	..
Fattening Mash	19	DUKKO	do. do.	Bran, pollard, wheat meal, oat pollard, bone meal, salt, limestone	10 0	4 0	4 0	1 0		3.0	.	...
Growing Mash	21	GROWELL	do. do.	Bran, pollard, wheat meal, oat pollard, meat meal, limestone salt, wheat germ	14 0	4.5	4 5	1.0		3 0	.	
Poultry Mash	25	K.B.	C. A. Kirkby & Sons	Wheat, meat and bone meals, bran, pollard, salt, riboflavin, cocoanut meal	13.0	3 45	7 0	1 0	1.21	2 0		
D Mash (Fattening)	36	MORLAY	Robert B. Young	Wheat meal, bran, pollard, bone meal, meat meal, minerals	10 5	3 0	5 0	1 5		4 0		
Laying Allmash	39	do.	do do.	Wheat meal, bran, pollard, bone meal, meat meal, minerals, limestone	13 0	3 0	6 0	2 0		4 0		
Growing Allmash	40	do	do do.	Wheat meal, bran, pollard bone meal, meat meal, minerals, limestone, ribon	12 0	3 0	6 0	2 0		4 75		.
Growing Mash	41	do	do. do.	do. do. do.	12 5	3 0	5 5	2.0		5.0		
Laying Mash No. 1	44	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Bran, pollard, wheat germ, wheat meals, meat, blood and liver meals, milk powder, ground limestone, salt	16 0	2 5	6.0	1.5		3.75		..
Special Laying Mash	45	do.	do. do. do.	Bran, pollard, wheat meals, liver meal, ground limestone, salt	14.0	2.5	7 0	1.5		3.75	.	...
Fattening Mash	46	do.	do. do. do.	Bran, pollard, wheat germ, wheat meal, meat meal, pea meal, milk powder, ground limestone, salt	13.0	2.0	6.5	1 25	...	3.75	...	...
Laying Mash "B"	78	WESTERN	David Gray & Co. Pty., Ltd.	Mill offal, wheat meal, yeast, bone meal, linseed meal, limestone	12 5	2 5	5.0	.		0.8	...	....

STOCK FOODS—*continued.*

Stock Foods.	Reg. No.	Brand	By whom Registered	Materials from which Made	Registered Analysis: Crude Protein	Crude Fat	Crude Fibre	Sodium Chloride	Phosphoric Acid (P_2O_5)	Lime Ca	Other	
					% (Min.)	% (Min.)	% (Max.)	% (Max.)	%	% (Max.)		
Laying Mash " A "	79	WESTERN	David Gray & Co. Pty, Ltd	Mill offal, wheat meal, yeast, fish meal, meat meal, limestone	14.0	3.0	5.0	..	.	0.8	...	...
Laying Mash	84	MORLAY	Robert B. Young	Wheat meal, bran, pollard, meat meal, bone meal, ground limestone, minerals	14.0	3.0	5.5	2.0	. .	4.0	.	....
Laying Pellets No. 2	87	RED COMB	Westralian Farmers Co-operative, Ltd.	Wheat meal, oat meal, pollard, bran, *buttermilk, salt, whey powder, ground limestone, *fish meal	11 0	3.0	7.0	1.0		1.0	....	....
Laying Pellets No. 1	88	do.	do. do. do.	Wheat meal, oat meal, pollard, bran, *butter milk, salt, whey powder, ground limestone, fish meal, meat meal	14 0	4.0	7.0	1.0	.	1.0	. ..	....
Growers Pellets	89	do.	do. do. do.	Wheat meal, oat meal, pollard, bran, *butter milk, salt, ground limestone, fishmeal, meat meal	13.0	4 0	7.5	1.0		1.0	....	....
Laying Mash No. 2	90	WESFARMERS	do. do. do.	Wheat meal, oat meal, pollard, bran, *butter milk, salt, whey powder, ground limestone	11.0	3 0	7 0	1.0		1.0	....	....
Laying Mash No. 1	91	do.	do. do. do.	Wheat meal, oat meal, pollard, bran, *butter milk, salt, whey powder, ground limestone, meat meal	14 0	4 0	7.0	1.0		1.0	..	....
Growers Mash	92	do.	do. do. do.	Wheat meal, oat meal, pollard, bran, *butter milk, salt, ground limestone, meat meal	13 0	4.0	7.5	1 0		1.0	....	....
Poultry Fattening Mash	97	do.	do. do. do.	Barley meal, wheat meal, pollard, bran, oat meal, salt, ground limestone,*buttermilk, *fishmeal	10 0	2.5	6.0	1.0	.	1.0	...	...
Poultry Fattening Pellets	98	RED COMB	do. do. do.	do. do. do.	10.0	2 5	6.0	1.0	....	1.0	....	....
6.—*Chickfoods.*												
Chickbuilder	9	MILLERS	W. H. Milne & Co.	Bran, pollard, wheat meal, cod liver oil, maize meal, bone meal, gristed oats, salt whey powder, oyster flour	15·0	4·0	5·5	1·5	2·0	3·0		
Chickstarter	10	do.	do. do.	(as above) and meatmeal	15·0	4·0	5·5	1·5	2·0	3·0		
Chickmash	15	VITALIZER	Barrow Linton & Co.	Bran Pollard, wheat meal, oat Pollard, wheat germ, meat meal, milk powder, salt, ground limestone, oil	15·0	4·0	4·5	1·0	. .	3·0		

Grain food	20	CHIC CHIC ...	do. do.	Wheat, oats, maize, peas	9·0	2·7	5 0	.	.	.		
Chickfood	23	W.A.P. APEX	W.A. Produce Co.	Wheat, maize, peas, oats shell-grit	10 0	3·0	6·5			.		
do.	32	H. & C. ..	Haynes & Clements	Wheat, maize, peas, grit	9 0	1 5	4 5		.			
Chickstarter	37	MORLAY	Robert B. Young ..	Wheat meal, bran, maize meal, meat meal, milk powder, ribon bone meal, vitamized oil, oyster grit, minerals	15·0	3·0	5·5	1·75	.	4·0		...
Chick Allmash	38	do. .	do. do. ...	Wheat meal, bran, maize meal, meat meal, milk powder, ribon bone meal, oyster grit, minerals	12·5	3 0	6 0	1·75		4·0	..	..
Chicken Milk No. 1	50	THOMAS ..	W. Thomas & Co. (W.A.), Ltd.	Milk powder, meat, liver, blood and bone meals, pollard, ground limestone, salt	25 0	1·5	4 0	3·0	.	15·0	.	...
Chicken Milk No. 2	51	do. ...	do. do.	Butter milk powder, albumen milk powder, bone meal, pollard, ground limestone, salt	20 0	1 5	4·0	3·0	.	15·0	...	....
Chicken Grain ...	59	do. ..	do. do.	Wheat, Maize, peas, shell grit .	9·0	1 5	4·5				...	...
Chick Starter	61	do. .	do. do.	Bran, pollard, wheat meal, wheat germ meat, fish, liver and blood, meals, milk powder, crayfish meal, cod liver oil, ground limestone, salt	18 0	2 5	6 0	1·0	.	3·75	...	...
Chickgrower	62	do.	do. do.	Bran, pollard, wheat meal, wheat germ, meat and liver meals, milk powder, crayfish meal, ground limestone, salt	14 5	2 5	6·0	1 25		3 75		....
Chickgrain .	73	WESTERN	David Gray & Co. Pty., Ltd	Maize, wheat, peas, oats, kalo, oyster grit	8 0	3 0	10 0			3·0	..	.
Chickstarter	80	do.	do do.	Mill offal, maize meal, wheat meal, yeast, fish liver oil, limestone, milk powder, meat meal	14 0	4 0	5 0			0 8	.	.
Chick Builder .	81	do. .	do. do.	Mill offal, maize meal, wheat meal, yeast, fish liver oil, limestone, milk powder, meat meal, bone meal	13 5	4 0	5 0			0 8	.	
Chick Mash "A"	85	WESFARMERS	Westralian Farmers Co-operative, Ltd.	Wheat meal, oaten, liver, maize and meat meals, pollard, bran *butter milk, ground limestone, manganese sulphate, salt, vitamised fish oil	15 0	4 0	7 0	Trace		Trace		.
Chick Pellets "A"	86	RED COMB	do do.	do. do. do.	15 0	4 0	7 0	Trace	.	Trace		.
Chick Mash "B"	93	WESFARMERS	do do.	Wheat meal, oaten, maize and meat meals, pollard, bran, *butter milk, ground limestone, salt vitamised fish oil	14 0	4 0	7 0	1 0		1 0	.	
Chick Pellets "B"	94	RED COMB	do do.	do. do. do.	14 0	4 0	7 0	1·0		1·0		....
Chick Food	124	ANCHOR	G. Wood Son & Co., Ltd.	Wheat, peas, barley, maize, crayfish meal, milk powder, oyster shell, bone meal, linseed	12 5	2 5	4·1	.	1·48	2·0		....
7.—Pig Foods.												
Pig Starter .	47	THOMAS	W. Thomas & Co. (W.A.), Ltd.	Bran, pollard, wheat meal, meat meal, bone meal, ground limestone, salt	12 0	2·5	6·5	2·0		4·0	....	....
Pig Grower .	48	do.	do. do.	do. do. do.	12 0	2 5	6 5	2·0	..	4·0	....	...

* When available.

STOCK FOODS—*continued.*

Stock Foods	Reg. No.	Brand	By whom Registered	Materials from which Made	Registered Analysis: Crude Protein	Crude Fat	Crude Fibre	Sodium Chloride	Phosphoric Acid (P_2O_5)	Lime Ca	Other	
					% (Min.)	% (Min.)	% (Max.)	% (Max.)	%	% (Max.)		
H.—*Horse Foods*												
Horse Food	130	EVELYN	Tropical Traders Ltd.	Pollard, linseed meal, linseed (whole), wheat, salt, chalk, magnesium sulphate, sulphur, sulphate of iron, copper sulphate, sodium bicarbonate, medicinal herbs	[illegible]	3 0	7 0	6 5	0 9	1 75	Sulphur (Max.) 2 5	
9.—*Dog Foods*												
Dog Biscuits	1	BOANS LOCAL	A. J. Robinson	Wheat, bone, meat, vegetable	15 0	4 0	3 0		2 5	2 5		
Charcoal Shapes	2	SNAPS	do. do.	Wheat, bone, meat, vegetable and charcoal	14 0	3 0	6 0		2 5	2 5		
Puppy Meal	3	do.	do. do.	Wheat, bone, meat, vegetable	15 0	4 0	2 0		3 5	4 0		
Plain Shapes	4	do.	do. do.	do. do. do.	15 0	4 0	2 0		3 5	3 5		
Puppy Biscuits	5	do.	do. do.	do. do. do.	15 0	4 0	2 0		3 5	4 0		
No. 1 Dog Biscuits	6	do.	do. do.	do. do. do.	15 0	4 0	2 0		3 5	4 0		
E.—STOCK LICK												
1.—*Mixed Stock Licks*					Copper Sulphate	Iron Sulphate	Cobalt	Sulphur	Sodium Bicarbonate			
Coast Compound	63	VITEMAC	A. H. McDonald & Co.	Pollard, iron sulphate, sodium bicarbonate, sulphur, cobalt chloride, copper sulphate, linseed, molasses	1 6	8 0	0 28	12 0	12 0			
								Sodium Chloride	Phosphoric Acid P_2O_5	Lime CaO		Sulphur
Medicated Lick	64	do.	do. do.	Salt, sulphate of iron, sodium bicarbonate, aloes, sulphur, magnesium sulphate, bone meal, molasses, potassium iodide, wheat meal		0 7		53 0	5 7	7 5		4 0
Mineral Concentrate	65	VETSOLICK	do. do.	Magnesium sulphate, sodium bicarbonate, carbo-ligni, pollard, sulphate of iron, sulphur, potassium iodide, bone meal					11 0	14 0	Iron 1 5	16 6
Di-Calcic Phosphate	68	C.S.M.I.	Cuming Smith & Mt. Lyell F.F. Ltd.	Calcium phosphate at least 90% of the P_2O_5 being as Di-calcic phosphate					37 00	28 0		
Di-Calcic Lick	69	do.	do. do.	Di-calcic phosphate, molasses, salt				38 00	18 00	13 00	Molasses 5 0	

Copper Lick	70	do.	do.	do.	Di-calcic phosphate, copper sulphate, salt	....	....	....	66·00	12·50	....	....	....
Denmark Lick Substitute	71	do.	do.	do.	Limonite, sulphate of copper, salt	....	....	....	38·00	....	....	....	Vt. Fe 20·00
Stock Lick	106	WESFARMERS	Westralian Farmers Co-operative, Ltd.		Salt, bone meal, bluestone, cobalt chloride manganese sulphate, iron sulphate	..	..	..	80·0	0·85	8·4	....	....
Lime Lick	107	do.	do.	do.	Salt, limestone		.	.	35·0	. .	22·0	....	....
Di-calcic Lick	108	do.	do	do.	Salt, di-calcic, phosphate	.		.	60·0	15·0	11·0	....	....
Denmark Lick Substitute	109	do.	do.	do.	Limonite, salt, copper sulphate	.		..	65 0	..	.	Iron 10·0	.
Kaf-o-vite	110	KAF-O-VITE	Goldsbrough Mort & Co., Ltd.		Rice, barley and linseed meals, wheat, pollard, bone charcoal, cane sugar and essence of aniseed	.		..	16·5	10·5	7·5	..	....
Cobaltised and Copperised Concentrated Sheep Lick "D"	111	VITA-LICK	do.	do.	Bone flour, bonecharcoal, sodium sulphate, sulphur, limonite potassium iodide, copper sulphate, cobalt chloride and meals from by-products of rice, cocoa and wheat	..		...	..	23·5	30·0	Min. Sulphur 2·0	Iron 1·3
Cobaltised and Copperised Concentrated Sheep Lick "G"	112	do.	do.	do.	Bone flour, bone charcoal, flowers of sulphur, limonite, potassium iodide, copper sulphate, cobalt chloride and meals from by-products of rice, cocoa and wheat	.		..	...	23·5	31·0	4·0	3·52
Cobaltised and Copperised Concentrated Sheep Lick Mixed "G"	113	do.	do.	do.	Bone flour, bone charcoal sulphur, limonite, potassium iodide, copper sulphate, cobalt chloride, meals from by-products of rice, cocoa and wheat, and salt			..	80 0	3·8	4·9	0·64	0·56
Cobaltised and Copperised Concentrated Sheep Lick Mixed "D"	114	do	do	do.	Bone flour, bone charcoal, sodium sulphate, sulphur, limonite, potassium iodide, copper sulphate, cobalt chloride, meals from by-products of rice, cocoa and wheat and salt				80 0	3·7	4·7	0 32	0·18
Cobaltised and Copperised Concentrated Cattle Lick "D"	115	do.	do.	do.	Bone flour, bone charcoal, sodium sulphate, sulphur, potassium iodide, copper sulphate, cobalt chloride and meals from rice, cocoa and wheat		....	...	.	21·7	29·0	0·4	3·4
Cobaltised and Copperised Concentrated Cattle Lick "G"	116	do.	do.	do.	do. do. do.			.	...	25·0	32·5	1·15	4·7
Cobaltised and Copperised Cattle Lick Mixed "D"	117	do.	do.	do.	do. do. do.	...	.	..	75·0	4·2	5·4	0·08	0·64

Stock Foods	Reg No	Brand	By whom Registered	Materials from which Made	Registered Analysis: Crude Protein	Crude Fat	Crude Fibre	Sodium Chloride	Phosphoric Acid (P_2O_5)	Lime CaO	Other	
					% (Min.)	% (Min.)	% (Max.)	% (Max.)	%	% (Max.)		
Cobaltised and Coppered Cattle Lick Mixed "G"	118	VITA LICK	Goldsbrough Mort & Co. Ltd.	Bone flour, bone charcoal, sodium sulphate, flowers of sulphur, potassium iodide, copper sulphate, cobalt chloride, meals from rice, cocoa and wheat and salt				75.0	4.4	5.8	0.22	0.88
Vita Lick Mineral Mixture	119	V.M.M.	do. do.	Bone flour, bone charcoal, spanish iron oxide, ferrous sulphate, flowers of sulphur, sodium sulphate, meals from rice and cocoanut, and salt				4.3	9.5	12.5	1.4	0.47
Chic-a-Vite	120	CHIC-A-VITE	do. do.	Bone flour, bone charcoal, ferrous sulphate, flowers of sulphur, sodium sulphate, gentian, cod liver oil, potassium iodide and by-products of rice					20.7	27.6	1.8	1.8
Por-co-Vite	121	POR-CO-VITE	do. do.	Bone flour, bone charcoal, sodium sulphate, flowers of sulphur, sodium chloride, limonite, calcium carbonate, copper sulphate, cobalt chloride, potassium iodide and cod liver oil				13.0	19.1	30.0	9.7	0.62
Salt Lick	129	LEPP	J. S. Corden & Co. (Vic.) Pty. Ltd.	Commercial salt				100.0				
2.—*Bone Meals*												
Sterilised Bone flour	26	TRI-CALOS	Davis Gelatine (Aust.) Pty. Ltd.	Bones	5.0				30.0	40.0		
Bone Meal	28	ANCHO	Anchorage Butchers Pty. Ltd.	Waste meat products	23.63	2.44		Trace	26.76	26.95		
Bone Meal	30	W.A.M.E.	The W.A. Meat Export Works	Bones	18.75			0.25	26.0	27.0		
Bone Meal	60	THOMAS	W. Thomas & Co. (W.A.) Ltd.	Bones	10.0				20.0	25.0		
Sterilised Bone Grit Meal	103	N.A.	Westralian Farmers Co-op. Ltd.	Bones	20.0			0.2	22.0	26.0		
Bone Meal	123	F.P.L. All-Bone	Fergusons Pty. Ltd.	Bones	18.0			1.0	27.0	34.0		

NOOGOORA BURR—A NEW WEED MENACE

G. R. W. MEADLY, Weeds Officer.

Although a number of major weed problems exist in Western Australia, several of the more serious species of the other States, such as skeleton weed and mint weed are not known to occur here. Until a few months ago this same statement could have been made concerning Noogoora burr, but investigations following the initial discovery of burrs in a used sack at a Northam flour mill have disclosed the presence of this plant in several localities.

In March of this year Mr. G. C. Hadrill, having noticed some strange burrs in a sack, forwarded specimens for identification. These proved to be Noogoora burr, and a hurried visit to Northam disclosed that the bag, which had been held, contained more than 300 mature burrs. The bag markings showed that it had been used several times, once as a container for 5 lb. bags of self-raising flour prepared by a Queensland mill. The presence of some maize grains and a consignment marking indicated that it had been used for the transport of maize for stock food from Queensland to this State.

Widespread publicity was given to the discovery, resulting in many reports of suspected plants and burrs. Fortunately in most cases other plants had been confused with Noogoora burr, but some very helpful information was obtained and plants were located at Nedlands, Harvey, Fremantle and Morley Park. Further burrs were found in an old sack wrapped around a box of butter sent to Bowgada and they were also detected in sunflower, maize and kalo corn imported for parrot food. More recently a burr was submitted by a Dangin farmer who found it in straw packing around a stove purchased from a Perth store.

It is quite apparent that Noogoora burr can make its entrance through many doors. During a period of a few months the following media of introduction and distribution have been detected—

1. Maize imported for the preparation of stock foods.
2. Maize, sunflower and sorghum seeds brought from other States especially Queensland, for parrot food.
3. Used sacks.
4. Packing material including that used around shrubs.

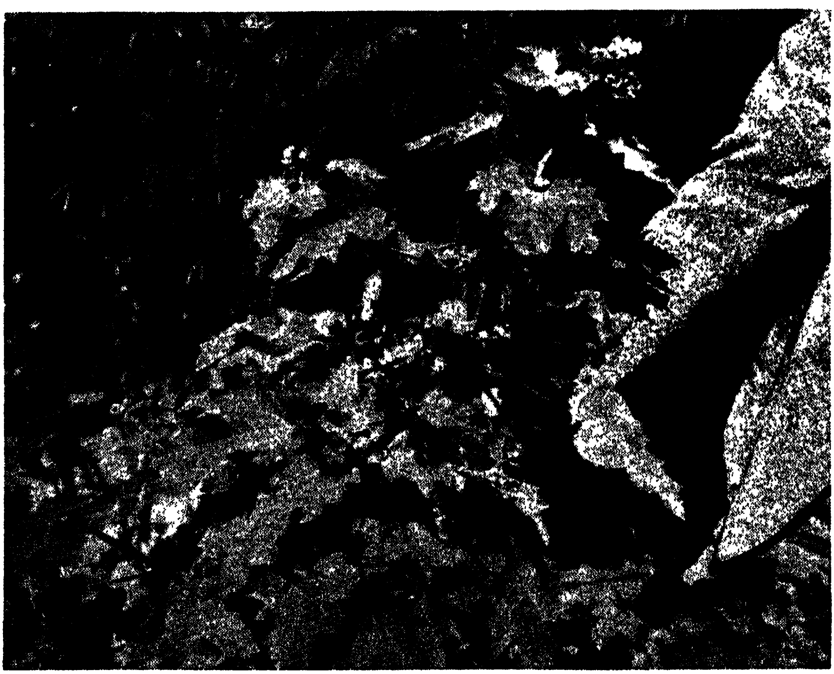
The plants at Harvey and Fremantle undoubtedly originated from bird-cage refuse and guided the search in the direction of seeds imported for bird food. The Nedlands occurrence was traced with certainty to packing material around shrubs obtained from a Brisbane nursery. Burrs were found in some of this material used for mulching a shrub in the garden. In other States stock have been an important distributing agency. Although Bathurst burr has been found attached to animals arriving from the Eastern States, so far Noogoora burr has not been detected.

DESCRIPTION.

Noogoora burr is a spreading annual attaining a height of six to eight feet, but sometimes flowering and seeding when less than one foot high. The young stems are mottled and the somewhat roughened leaves are shaped as shown in the illustration. They are three to six inches broad and have a stalk varying from one to five inches in length. The inconspicuous flower heads are formed in clusters

close to the stem. The fruits (burrs), half an inch or somewhat more in length are terminated by two erect or slightly curved beaks. The burrs are straw to brown in colour when mature and each contains two flat seeds.

A plant of Noogoora burr in a Nedlands garden.



Showing foliage and some burrs.

SIGNIFICANCE AS A WEED.

It is generally accepted that this weed was first introduced to Australia at Noogoora Station, Queensland in the early sixties of last century, presumably as an impurity in imported cotton seed. Southern Europe and central Asia are regarded as being its natural habitat but it now occurs in many other countries. It now provides Queensland's No. 1 weed problem, infesting as it does the greater part of the sheep country in that State and seriously menacing the remainder. In recent years as much as 16 per cent. of the Queensland wool clip has contained the burr, representing a monetary loss of £1¼ million in one season. On many properties it has been necessary to abandon sheep raising in favour of cattle.

Besides the loss in value of the clip which can be estimated, the debit against this weed must also include the reduced carrying capacity of infested areas along with the cost of control measures. Further, stock losses have been caused by eating this plant, especially in the seedling stage, no doubt due to the presence of a glucoside which has been isolated.

Noogoora burr also presents a serious problem in Northern New South Wales, but is very limited in Victoria and South Australia and is not known to occur in Tasmania.

Burrs removed from the packing material shown on the left.

At a time when only a few plants have been found in Western Australia it is very interesting to recall the following statement concerning this weed made by Mr. J. H. Maiden when Government Botanist of New South Wales. "I was talking to Mr. F. M. Bailey, the Government Botanist of Queensland, a few days ago (this was written in 1896), about Noogoora burr. He said 'I well remember when £50 would have stamped it out in my colony; now it would take untold wealth to do it.'

"In 1899 I estimated that in New South Wales £1,000 judiciously spent would entirely free us from the pest: without any desire to be sensational, I stated that, if allowed to spread unchecked, it would in a few years deteriorate our territory to the value of a million of money. Today—1920—this is probably not very wide of the mark."

Noogoora burr.
The separate burr is somewhat larger than natural size.

PREVENTIVE ACTION.

As seeds, especially when imported for bird seed or stock food, have been the main means of introduction, action was taken immediately to ensure that all such lines were inspected upon arrival. The following proclamation was made under the Noxious Weeds Act:—

1. No person shall sell or dispose of stocks of maize, sunflower or sorghums or any mixtures containing these grains without the previous consent in writing of the Minister or an inspector first had and obtained.

2. No person shall import grains or seeds from any other State of Australia unless and until a certificate has been obtained from the Department of Agriculture of the exporting State to the effect that the grains and seeds imported are free from the following noxious weeds—Bathurst burr (Xanthium spinosum L.), Noogoora burr (Xanthium pungens Wallr.), Mint weed (Salvia reflexa Hornem.) and Thorn apples (Datura spp.) and at least seven

days prior to the arrival of the imported grains and seeds the Minister for Agriculture shall be notified of the intent to import such grains and seeds.

3. No person shall sell or dispose or otherwise make use of bags or any other containers of seeds and grains found to contain noxious weeds without the previous consent in writing of the Minister or an inspector first had and obtained.

4. The Minister or an inspector may destroy bags or any other containers found to contain noxious weeds where such bags or containers are being used or apparently kept ready for use.

All plants, including packing material, from other States, especially Queensland, are being subjected to a very close inspection, and the thorough examination of imported animals is being continued. The localities where plants have been found are being checked from time to time.

CONTROL MEASURES.

As yet only odd plants have been located and complete destruction by hoeing and burning has been possible. In cases where plants have shed mature burrs, as many as possible should be gathered and destroyed and a fire made on the affected ground. Each burr contains two seeds which seldom germinate at the same time and may retain their vitality for many years. Sites where plants have seeded should be kept under observation for a number of years, with a view to detecting delayed germination. Seedlings usually appear during the spring or early summer; warm moist conditions being conducive to germination. Spraying with 2, 4-D or hormone-like weed killers is an effective treatment and Queensland is embarking on large scale chemical operations.

It is probable that all Noogoora burr plants occurring in Western Australia have not been located. Early recognition of serious weeds is of primary importance in order that control measures may be taken before they become established. Any plant suspected of being Noogoora burr, or, for that matter, having the appearance of an undesirable weed should be sent to the Department of Agriculture for identification. If the plant is of little consequence no harm has been done, but if of major importance, serious loss to the State and individual farmers can be prevented.

ERRATA.

Journal of Agriculture, Volume XXVI. No 1. March, 1949.

Page 37, Table 2, last line for "13 13 3, 10.53, 5.02" substitute "14 0 6, 10.81, 5.15."

Page 38, Table 3, for "Guernsey (8 herds) 6,340, 51.12, 324.75, 13 19 11, 5.03, 10.34" substitute "Guernsey (8 herds), 6,340, 5.12, 324.75, 15 14 0, 5.49, 11.62."

Page 40, Table 5, line five of table for "5, N, D, Guernsey, 386.28, 5,470, 43 8 6, 4 11 2, 47 19 8, 10 2 6, 37 17 2, 6.29" substitute "5, N, D, Guernsey, 386.28, 5,470, 43 8 6, 4 11 2, 47 19 8, 21 13 6, 26 6 2, 13.5."

HORMEX TRIAL ON DOCKS AT DENMARK RESEARCH STATION.

By V. E. WESTON.

AN area of 48 square yards was selected in paddock 4 for this trial, with the following botanical analysis:—

	%
Docks	80
Wild Geranium	5
Clovers (Sub)	5
Rye Grass	10

The spray was applied when the docks were 12 inches to 18 inches and the remainder 8 inches to 9 inches high.

Hormex spray was diluted to ¼ pint of Hormex to 2½ gallons of water giving 0.4 per cent. 2, 4– dichloro phenoxyacetic acid. One gallon of this mixture was sprayed as finely as possible over the 48 square yard area.

The plot was treated on 19/10/48 on a warm sultry day. The following day the docks had a greyish wilted appearance.

The following further observations were made:—

22/10/48—Docks showing burnt effect—leaves browning and drying up.

25/10/48—Docks considerably browned and withered—clover and geraniums also browning.

2/11/49—Docks shrivelled and stunted, clovers and geraniums browning and dying back.

20/11/49—Area 99 per cent. rye grass survival—showing much bare ground with browned and withered docks, clovers and geraniums. Eight stunted dock plants survived on the area.

A further spraying at the same rate was again applied after early autumn germination on April 20th, 1949.

This time the plot was treated when growth had reached a height of 8 inches to 9 inches. At this stage the botanical analysis had altered as follows:—

	%
Docks	50
Rye Grass	50

No clovers or other weeds were present.

The average number of dock plants per square yard was approximately 200.

The weather was fine and warm during and after treatment. At the end of seven days there was very little trace of Docks. By May 20th the area had a 99 per cent. coverage of healthy rye grass. Twelve dock plants survived this spraying. By August 20th, 1949, further germinations had increased the dock plants to three per square yard.

The results were most impressive and, providing 2, 4 – D can be obtained at a reasonable cost, old weed infested pastures could be rapidly improved.

The method of spraying could be improved also inasmuch as the equipment used in this trail did not produce a fine enough spray.

THE CUTTING OF SEED POTATOES

By E. T. Morgan, Chief Adviser—Vegetable Industry.

THE cutting of large potatoes to provide seed for the planting of the potato crop has for many years been a routine practice in Western Australia. This is particularly the case in respect to the planting of crops in the cool weather period approximately from June to October in each year.

It is customary to plant whole tubers, so-called "round seed" in the hot weather period generally in January and February.

This routine practice is, however, being varied and the use of cut seed is becoming more general in the irrigation areas even during the hot period when loss is likely to occur through the rotting of cut tubers.

It has been interesting to note the results of some experiments conducted at Cambridge (England) in relation to the cutting of potatoes for seed.

Investigations were made regarding the storage of cut sets including periods of time longer than a six-day maximum, which time had been allowed in previous experiments. The experiments showed that best results were obtained when planting took place immediately after cutting.

With cut "seed sized" tubers, the percentage of germination was 95.5 per cent. planted immediately after cutting and 84.5 per cent. after storage for thirty-four (34) days.

With cut "ware sized" tubers, the germination fell from 95.3 per cent. planted immediately after cutting to 76.7 per cent. planted thirteen (13) days after cutting, and 70 per cent. planted after thirty-four (34) days.

It is interesting to note that the loss in germination in the cutting of large potatoes was greater than when "seed sized" tubers were cut. Generally, the cutting of large potatoes results in large cut surfaces being exposed, whereas with smaller potatoes, so-called "splitters," the exposed surface is generally smaller and is therefore not calculated to be so liable to contract soil-borne diseases, to the extent that could be expected with larger unprotected surfaces, when planted.

From the experiments quoted the yields from plots decreased proportionately to the length of time that elapsed between cutting and planting. The most successful treatment for cut sets, from the standpoint of yield and plant establishment was the immediate planting after cutting.

The moisture and temperature conditions of the soil have been reported by American and Canadian workers as of great importance in influencing the incidence of rotting of cut tubers. Generally speaking, conditions in Great Britain are not inimical to freshly cut sets, but growers there are advised to use well healed cut sets for preference when soil conditions are bad.

In Western Australia conditions vary according to district and the time of planting. It is usual to find that crops planted in the period from May to August are sown on land that is either "new" or has not produced potatoes for a number of years. On such land the planting of cut seed has given little cause for concern and cut sets are sown immediately after cutting or within a few days of cutting, generally with good results.

On the other hand, planting in the summer period, November to February, is often done on land that has been continuously under potato cultivation for a number of years, and in many cases harmful soil organisms have evidently been built up to an extent that can prove harmful to cut tubers. Under such conditions the planting of freshly cut sets has often given disappointing results and the need for the cut surfaces to be calloused over prior to planting is emphasised. This healing process or suberising has been found to be satisfactory when cutting is done under moist conditions. When cutting has been done under dry conditions, however, callousing has not, in many instances, been satisfactory.

The wet bag treatment of cut seed potatoes has been advocated by the Department of Agriculture for many years and while old growers are quite familiar with the process, new growers may not be aware of it.

In order to take advantage of the fact that healing is satisfactory under moist conditions, the thorough wetting of the bags, into which the tubers are cut, allows of the necessary moisture for effective suberising of the cut surfaces. When a tuber is cut the suberin exuded from the cut surface combines with moisture to make a continuous layer over the surface which on drying forms a protective cover. For best results the bags should be well soaked prior to their being used as containers. It is good practice to cover the top of each bag when filled with another wetted one. The bags are then allowed to dry without further wetting. Where cutting is done into boxes they should be covered with wet bags until the cut surfaces have well calloused over. The seed should be kept in a cool sheltered position until required for planting.

From 24 to 48 hours are necessary to dry the cut surfaces of the tubers after which planting should be undertaken as soon as possible. From observations made in this State, it is not advisable to allow more than seven days to elapse following cutting before the sets are planted.

A further precaution during hot weather is to avoid, as far as possible, fertiliser coming into contact with the cut sets. If the sets are well pushed into the mould at the side of the turned furrow, and the fertiliser applied afterwards, little fear of fertiliser burn may be expected.

Another precaution, if planting takes place during heat wave conditions, which can often be expected in January and February, is to avoid the turning in of heated top soil on to cut tubers. If planting of cut seed is done in the early part of the day, following on with "round seed" during the hotter period, results should be satisfactory.

Quite a number of complaints in regard to faulty germination have come from the Manjimup district in recent years and it behoves growers to take all care in respect to the treatment and planting of cut seed. The wet bag method has proved more successful than where substances such as lime, sulphur, etc., have been used to dry cut surfaces of tubers.

LITERATURE CITED.

G. D. H. Bell, Ph.D., and H. W. Howard, Ph.D., "Seed Potato Cutting Experiments," Journal of the British Ministry of Agriculture, Vol. XLVIII, No 4.

POWDERY MILDEW OR OIDIUM OF GRAPES

W. P. CASS SMITH, Government Plant Pathologist
H. L. HARVEY, Assistant Plant Pathologist.

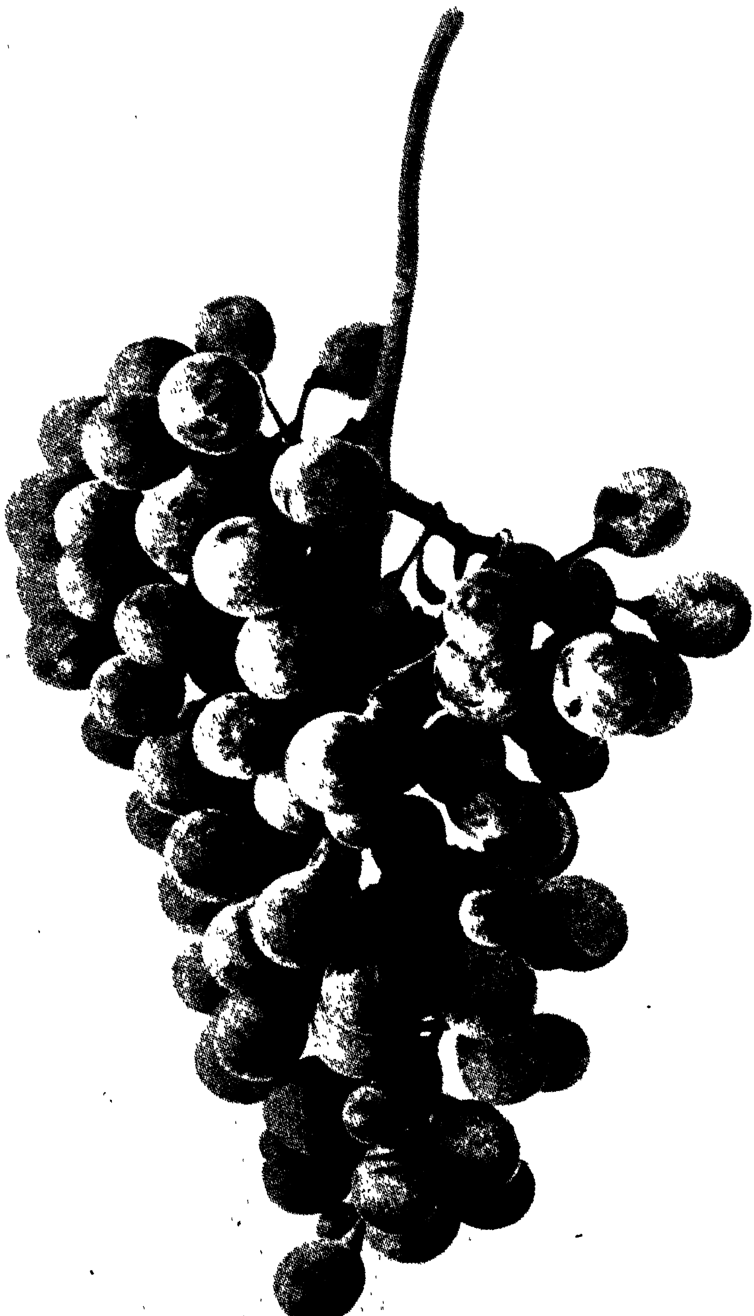
POWDERY mildew is the most common disease of grapes in Western Australia and occurs widely in commercial vineyards and home gardens. In seasons favourable for its development it causes considerable reduction in fruit yield and quality, especially when preventive and control measures are not rigidly applied.

Symptoms.

Powdery mildew is a fungus* which grows mainly on the surface rather than internally and is generally quite conspicuous as a dirty white powdery growth occurring as small or large patches on leaves, green canes and fruits.

**Oidium Tuckeri.*

Powdery mildew on vine leaf
(*After Minis. Agric. Fisheries Advis. Leaflet* 207.)



Powdery mildew on grapes.
(*After Morwood.*)

It tends to rub off easily. When infection is heavy at flowering numbers of berries do not form and this results in a loose bunch rather than a well-developed compact one. The few berries that do set tend to remain small in size. Cracking of the berries may also result from mildew attack. When the mildew disappears later in the season a dark mark with a web-like pattern remains to indicate where it has been. These marks are often seen on leaves, berries and canes.

Dark marks on canes following mildew attack.
(*After Jacob.*)

Conditions favourable to the disease.

Humid weather with warm to hot conditions (75° to 95° Fahrenheit) favour the spread of the disease. Such conditions prevailed in the spring and summer months of 1947-48 when serious losses resulted in commercial vineyards. In home gardens conditions for the spread of mildew are brought about in most

Berries badly affected and cracked.
(*After Foex.*)

seasons firstly by wetting vines with sprinklers, and secondly by encouraging the development of excessive foliage for shade and thus preventing adequate air circulation and the free entry of sunlight.

Losses in the 1947-48 season.

Weather conditions in the 1947-48 season were such that a rapid spread of oidium resulted and some commercial growers expressed dissatisfaction with the quality of dusting sulphur then being supplied compared with pre-war material. From a survey made at the time it was concluded that the high incidence of the disease was mainly due to (1) very favourable climatic conditions for disease development and (2) the absence of, or too late application of, control measures. Comparative freedom from the disease for several years had lulled many growers into a false sense of security. Tests carried out by the Government Chemist showed no deterioration in the quality of the ground dusting sulphur.

Oidium Control Experiment.

An experiment was arranged at Caversham on currant vines which are known to be susceptible to mildew attack, the purpose being to check the effectiveness of the ground dusting sulphur as used by growers during the last few seasons, and also explore the possibilities of six other fungicides (see Table 1).

The area under test consisted of some 256 vines. Three applications of the fungicides were made at approximately three to four weeks intervals, coinciding with the following growth stages, (a) when shoots were three to four inches long, (b) early blossoming, (c) after fruit set.

Sufficient spray was used to give a thorough wetting of the foliage and in the case of the sulphur dust sufficient to cover all green parts with a fine film.

Results.

The assessment of oidium up to picking showed that vines treated with sulphur dust were least damaged by the disease while a fair control was obtained by the other fungicides. The untreated vines were heavily infected

TABLE 1.

FRESH CURRANT YIELDS AND QUALITY.

(Average of Four Blocks.)

Treatment.	Yield.		Quality.
	Lbs. per three Vines.	Tons per acre.	
Sulphur Dust	109.5	6.5	Good
Colloidal Sulphur	95.5	5.7	Good
Colloidal Sulphur + Copper Oxychloride	87.0	5.2	Good
Colloidal Sulphur + Bordeaux mixture	85.5	5.1	Good
Zinc Copper Chromate . .	84.25	5.0	Good
Lime Sulphur	80.5	4.8	Medium
T.M.T.D.*	68.5	4.1	Poor
Untreated	40.75	2.4	Very poor
	P.05 = ±25.19 P.01 = ±34.29		

* Tetramethyl thiuram disulphide.

resulting in numerous withered and cracked fruits which reduced yield and quality considerably. Fresh fruit yields and quality taken at picking time reflected the superiority of sulphur dust in mildew control. These are shown in Table 1.

Recommendations for Control.

1. Dusting sulphur should be applied as a routine preventive measure at least three times, namely, when shoots are about four inches long, the second three weeks later and the third after fruit set. Further applications may be necessary if humid or showery weather develops later in the season. To avoid possible scorching of foliage in very hot weather early morning or late evening applications are desirable.

It is important in dusting to apply a fine but complete cover of sulphur to all green parts of the vine. This may be done by passing a good cloud of dust through the foliage.

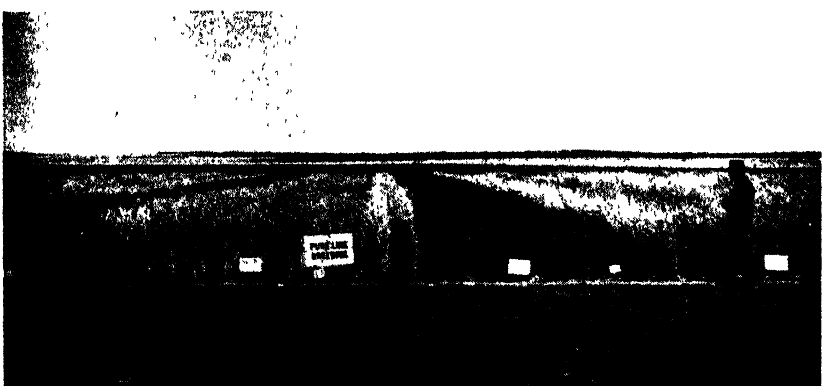
2. Spraying sulphur (Colloidal sulphur) may be combined with Bordeaux mixture when the latter is used for anthracnose control. (Add 1¼ lb. to 40 gallons.)

3. Sanitation. Prunings and other vine debris such as withered or discarded bunches should be cleared from the vineyard and burnt as soon as possible.

PEDIGREE SEED PRODUCTION.

I. THOMAS, Superintendent of Wheat Farming.
H. G. CARISS, Agricultural Adviser.

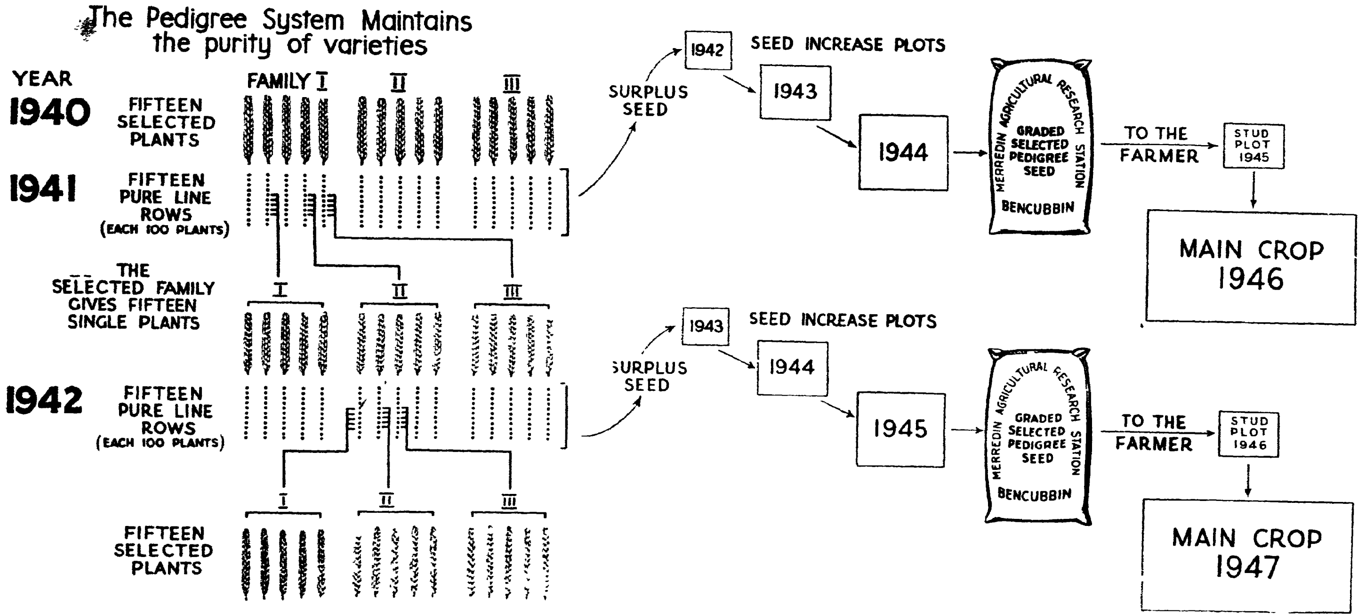
IN the quest for higher yields the farmer is concerned with a number of sources of possible loss. When seed bed preparation and planting dates are satisfactory, the highest yields will be obtained from the best seed sample of the variety most suited to the district. The farmer is therefore concerned firstly with the choice of suitable varieties for his district and secondly with ensuring grain supplies of them for seed purposes.



The "pure line breeding" section of the Test Rows which serves to keep varieties breeding true for the varietal characteristics as the initial step in the production of pedigree seed.

To enable Farmers to obtain maximum yields from the standard and improved varieties

THE DEPARTMENT OF AGRICULTURE DISTRIBUTES PURE GRADED PEDIGREE SEED



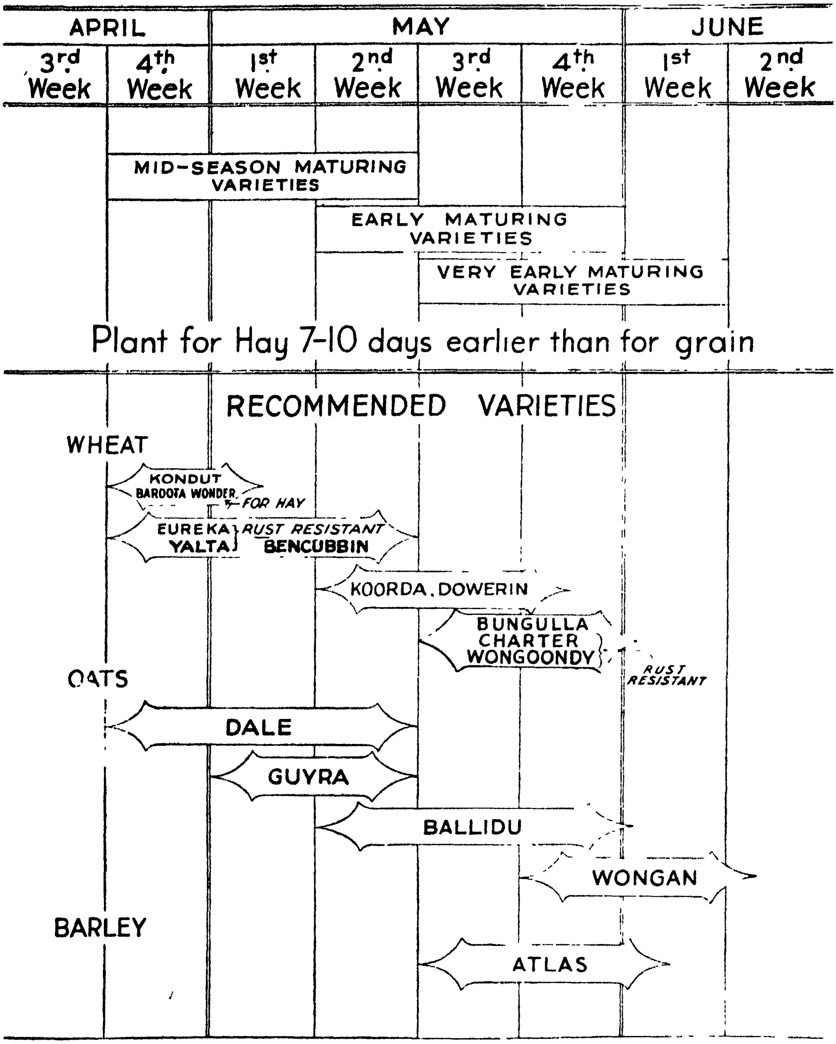


Fig. 2.—Early maturing zone

For the 1947 seeding, twelve varieties accounted for over 90 per cent. of the acreage sown to wheat for all purposes in W.A., and 76 per cent. of the total was sown to the three leading varieties. W.A.-bred varieties accounted for two-thirds of the acreage sown.

The production of pedigree seed of the recommended cereal varieties has been a major function for many years of the agricultural research stations situated in the wheatbelt.

The Department of Agriculture is concerned firstly with producing new and improved varieties by crossbreeding and selection, and secondly with ensuring that supplies of pure seed of them are available to farmers. To maintain the variety so that it breeds "true" for the desirable superior characters, the Department maintains pure lines of the recommended cereals. The maintenance of pure line rows involves a pedigree system which immediately reveals any deviation from type.

The production of pedigree seed involves highly specialised work and the actual cost is relatively high when compared with commercial production of grain. At the Merredin and Wongan Hills Research Stations "pure line" breeding plots are conducted and it is from these plots that the actual seed obtained by the farmer is produced. The "pure line" rows are maintained by selecting each year the most prolific plants having the typical characteristics of the varieties concerned. The balance of the seed is planted in a larger block known as the "accumulation block" from which the seed is obtained for the planting of the "stud" plots at the various research stations, these in their turn providing the seed for the bulk plots from which the farmers' seed is supplied.

The surplus seed from the pedigree rows is increased each year until sufficient is available for distribution to the industry. (Fig. 1). The identity and therefore the pedigree of all seed is maintained during the years of increase. Many farmers ensure their supplies by buying each year sufficient pedigree seed

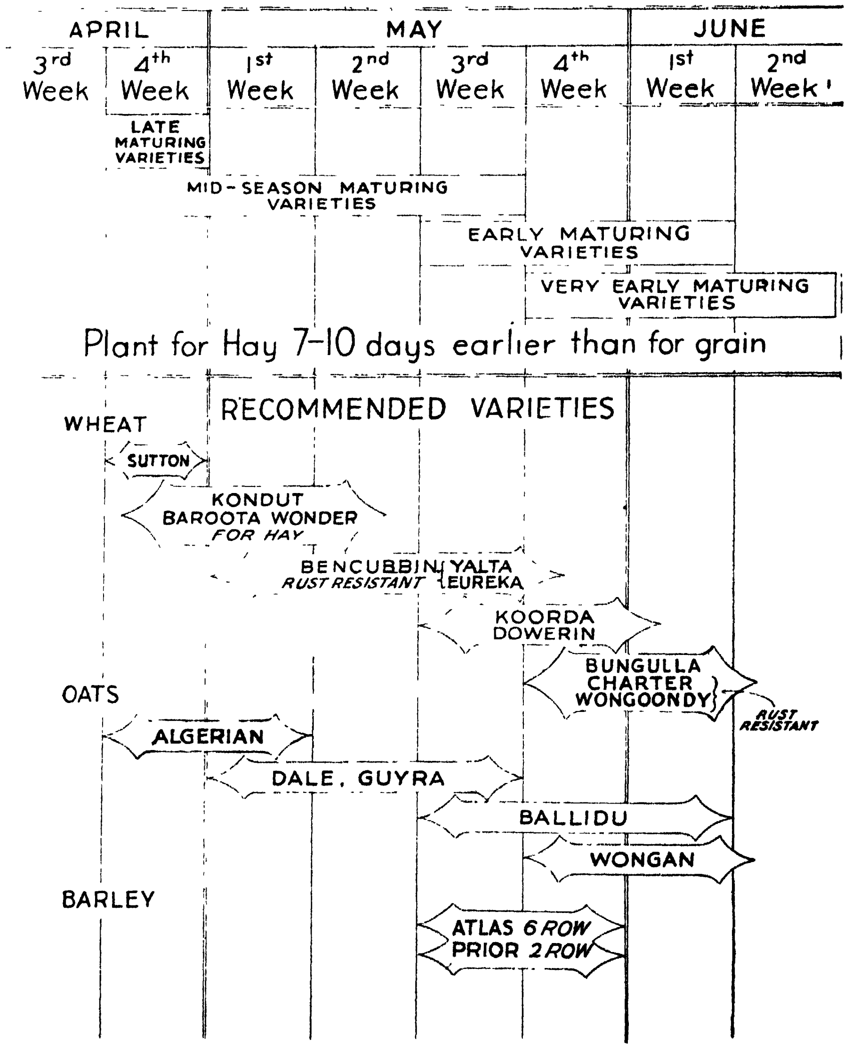


Fig. 3.—Midseason maturing zone.

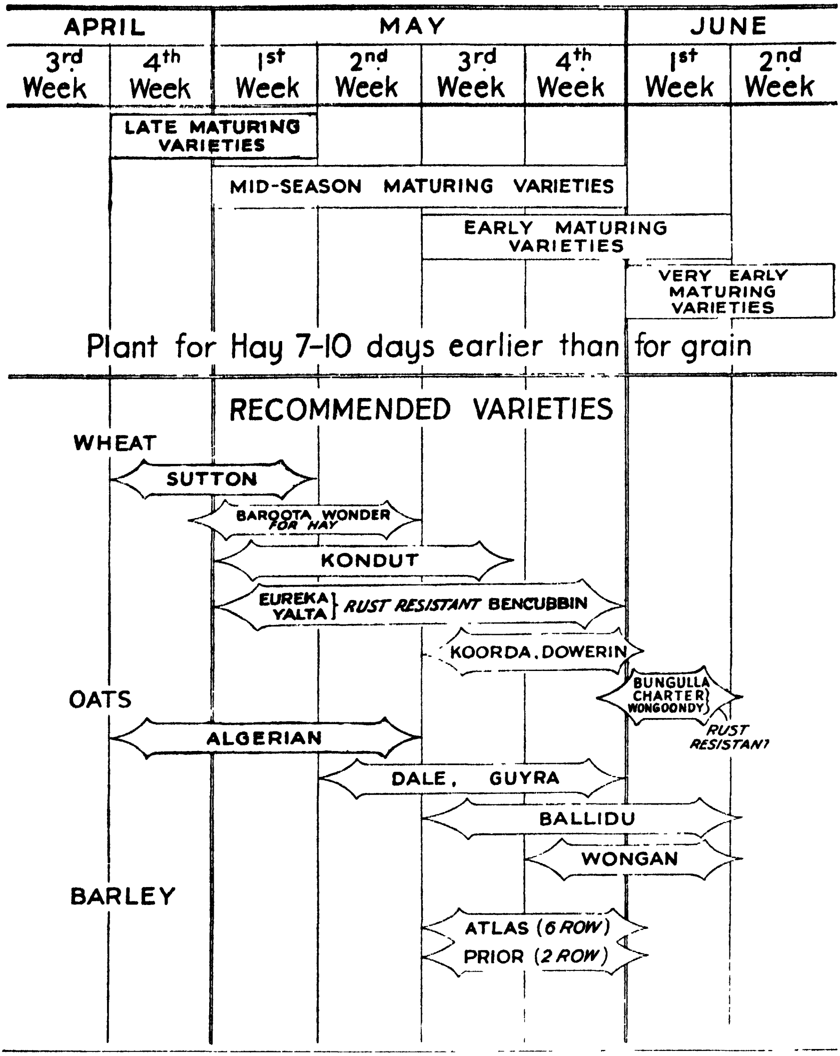


Fig. 4.—Late maturing zone

from the Department of Agriculture for a small plot which is gradually built up until sufficient is available for planting the whole farm. This system enables the farmer, with appropriate care, to maintain his varieties free of admixture and therefore capable of giving the highest yields within the capacity of that variety.

It will thus be seen that the pedigree seed obtained by farmers is only four years away from the single selected plants. By adopting the method outlined above, it is possible to maintain the purity and high yielding capacity of the variety as it is not possible to have an admixture when single grain is used in the production of any one variety.

Numerous experiments have shown that the larger grains will yield more than smaller ones of the same variety. This indicates the desirability of grading seed if maximum yields are to be obtained and all seed distributed from the Research Stations is so treated.

In previous papers by Thomas, Millington and Cariss, 1944, 1947, the utilisation of the main cereal varieties was discussed. In those papers the wheatbelt was divided into three zones, according to the annual rainfall and for convenience, some of the tables and comments have been included herewith.

The three zones and the road board districts included in each are:—

Zone 1.	*Zone* 2.	*Zone* 3.
Under 14 *in.*—	14-18 *in.*—	18-20 *in. and above*—
Mukinbudin	Northam	Greenough
Mullewa	Northampton	Irwin
Morawa	Upper Chapman	Moora
Perenjori	Geraldton	Victoria Plains
Dalwallinu	Mingenew	Toodyay
Dowerin	Three Springs	York
Wyalkatchem	Carnamah	Brookton
Koorda	Wongan-Ballidu	Cuballing
Mt. Marshall	Goomalling	Narrogin
Westonia	Meckering	Wagin
Nungarin	Corrigin	Katanning
Merredin	Kulin	Broomehill
Kellerberrin	Quairading	Tambellup
Kununoppin	Wickepin	Woodanilling
Bruce Rock	Dumbleyung	Esperance
Narembeen	Kent	(Southern 1/3)
Kondinin	Beverley	
Lake Grace	Pingelly	
Yilgarn	Gnowangerup	
Dundas	Esperance (Northern 2/3)	

In addition to obtaining a good sample of grain for seed purposes it is essential that each variety should be planted during the appropriate period for its maturity.

Seeding calendars have also been prepared for each zone covering the recommended varieties and their appropriate planting periods. (Figs. 2, 3, 4.)

It must be mentioned here that the indicated planting periods should be used as a guide with due regard to local conditions, as it will be appreciated that it is not possible to give specific recommendations for individual districts within a zone.

With all cereal plantings it is desirable that the seeding programme commence with the latest maturing variety being planted and be completed with the earlier maturing ones. For maximum yields it is not generally advisable to extend the planting periods for various maturities beyond those indicated. It is very desirable, however, that sufficient seed of both early and mid-season varieties be reserved and kept on hand in order that, if necessary, the areas sown to each can be adjusted to meet seasonal conditions.

With regard to the planting of cereals for green fodder (Cariss 1945), these are normally sown as early as possible in the season, irrespective of the maturity of the variety being used. In this connection the cereal varieties recommended are:—

Oats:

Algerian.—Late maturing (high rainfall areas particularly).
Dale.—Mid-season maturing.
Fulghum.—Mid-season maturing (standard grazing oat).
Ballidu.—Early maturing.
Wongan.—Very early maturing.

Barley:

Atlas.—Early maturing (very satisfactory).

For distribution from the 1949-50 harvest it is anticipated that pedigree seed of nine varieties of wheat, six of oats and three of barley will be available. Short descriptions of these varieties are:—

WHEAT VARIETIES.

With regard to maturity standards it is customary in Western Australia to classify wheat varieties into four standard maturity groups relative to the control variety, Gluyas Early:—

(i) Very early maturing—flowering five or more days earlier than Gluyas Early.

(ii) Early maturing—flowering four days earlier to three days later than Gluyas Early.

(iii) Mid-season maturing—flowering four to nine days later than Gluyas Early.

(iv) Late and late mid-season—flowering ten or more days later than Gluyas Early.

The following are short descriptions of the recommended varieties which are at present being produced as pedigree seed:—

Mid-season Varieties.

Kondut.—Bred at the Wongan Hills Light Lands Research Station, Kondut, has yielded well, over a wide range of soil and climatic conditions.

Although not rust resistant, it gives better yields under epidemic conditions than Bencubbin and Nabawa. It is resistant to flag smut.

The straw is stout and the variety can be recommended for early planting, particularly on light land and in rust liable districts.

Kondut yields flour which is usually superior in strength to that of the f.a.q.

Eureka.—This variety was bred by the New South Wales Department of Agriculture, and released as a resistant wheat for planting in rust liable areas. In 1941 a new race of rust was isolated in Northern New South Wales, capable of attacking Eureka, and this race, designated 126B, has now become the most prevalent race in Queensland, New South Wales, Victoria and South Australia, and Eureka and its derivative varieties can no longer be regarded as rust resistant in those States. Race 126B (previously designated Race 34 Biotype) has not yet been definitely isolated in Western Australia, and Eureka can still be regarded as a resistant variety in this State.

Eureka is a stout strawed rather tall growing brown chaffed variety with translucent grain. Under slow ripening conditions the grain frequently mottles. The flour strength of Eureka is well above the f.a.q. of the State. It is resistant to flag smut. The desirable planting date for Eureka in each district would be about the same as for Bencubbin.

Bencubbin.—The standard mid-season wheat which is the most extensively grown variety in Western Australia and also Australia. The straw strength tends to be weak on light land but is satisfactory for hay. Bencubbin is notable for its high yields under inferior seasonal conditions, and although very susceptible to rust is resistant to flag smut. Its flour strength is equal to the State f.a.q.

Yalta.—This midseason maturing variety was bred by the New South Wales Department of Agriculture as a rust resistant variety, obtaining its resistance from Kenya C6042. However in 1948 at least two new races of rust were isolated in Northern New South Wales capable of attacking all varieties deriving their resistance from this source. (Thomas, 1948). This variety is resistant to 126 and 126B, and can still be regarded as a resistant variety in Western Australia until such time as the new races are recorded here. The straw is of medium height, stands well and the baking quality of the grain is in the premium class. It is highly resistant, but not immune to flag smut. The results of trials to date confirm the opinion that the variety will be a very suitable one for replacing Eureka as a mid-season variety.

Dowerin.—This variety was selected at the Merredin Research Station from a cross between Sword and Kenya C6041. It is resistant to all known races of stem rust in Australia, and is the only registered released variety which derives its resistance from this particular Kenya parent. An early mid-season maturing variety it is tall growing with fine straw and a tendency to weakness under certain conditions. The grain quality is in the upper range of the f.a.q. It is resistant to flag smut and powdery mildew and has yielded well under trial particularly in the higher rainfall areas to which it seems to be most suited.

Early Maturing.

Koorda.—A relatively recent release by the West Australian Department of Agriculture, Koorda has yielded well on the lighter soils where its strong straw is of great value. Koorda is practically immune to flag smut and tends to be rust escaping in all but the heaviest epidemics. The flour strength of Koorda is about the same as that of the f.a.q. standard.

In yield trials on the Research Stations, Koorda has out-yielded Merredin a variety which it has been designed to replace.

Wongoondy.—This variety which was selected at the Merredin Research Station from a cross between Eureka and Bungulla is an early maturing variety which under suitable conditions produces grain approaching premium quality. It is a medium tall growing variety with a straw of excellent standing ability and holds it grain well. It is highly resistant to Race 126 of stem rust (previously designated Race 34) but, like its Eureka parent, is susceptible to Race 126B. This variety gives excellent promise and is favoured for its straw strength, earliness, prolificacy and its satisfactory grain quality.

Very Early Maturing.

Bungulla.—The standard early maturing variety and a selection from Bencubbin. Like Bencubbin is notable for its high yields, particularly under low rainfall conditions.

Because of its early maturity, it usually suffers relatively little rust damage. The straw strength is satisfactory on the heavier soil types, but Koorda is to be preferred on light soils in all but the drier districts.

Bungulla is satisfactory for hay whilst the flour strength is equal to the f.a.q. of the State. It is resistant to flag smut but not to rust.

Hay Variety.

The variety Baroota Wonder is grown almost exclusively for hay. It is a relatively tall growing wheat and remains green to the base until haycutting time. It is very susceptible to loose smut and rust, but moderately resistant to flag smut.

OAT VARIETIES.

Oats are notoriously difficult crops to harvest for grain, particularly following adverse weather conditions, and plant breeders therefore, have been particularly concerned with straw strength and non-shedding. The W.A.-bred oat varieties, Dale, Ballidu and Wongan, represent a notable achievement in respect to improved straw strength and ability to withstand unfavourable weather. These three varieties are selections made by Mr. D. R. Bateman at the Wongan Hills Research Station from a Mulga-Burt's Early cross and they fulfil the requirements of a general purpose oat. They are suitable for grain and hay and also for early green grazing and recovery. With their differing maturities they cover the range of the planting season.

Oats are classified as to maturity in much the same manner as are wheats:—

Very Early Maturing: Flowering four or more days earlier than Mulga.

Early Maturing: Three days earlier to six days later than Mulga.

Mid-season Maturing: Seven to fourteen days later than Mulga.

Late Maturing: Fifteen or more days after Mulga.

Oats are being increasingly used as a source of early green feed. They are sown either on fallow or stubble land in early April and fed off six to eight weeks after the opening rain of the season. Varieties vary considerably in their suitability for this purpose both in respect to the quantity of green feed produced and in their ability to recover after grazing.

Oats are used extensively for hay for which purpose the leading varieties are well suited The present oat breeding programme aims at the development of varieties combining large grain size and straw strength and the retention of the long juvenile phase of Fulghum in a stronger strawed variety.

The following are short descriptions of the recommended varieties which are at present being produced as pedigree seed:—

Late Maturing.

Algerian.—The standard late general purpose oat which is cultivated chiefly in the Great Southern areas of the wheat belt, and the higher rainfall districts of the State. It is also used extensively for oatmeal manufacture.

Mid-season Maturing.

Guyra.—The standard mid-season variety which is notable chiefly for its plump grain. Although a popular hay variety the straw tends to be very coarse under favourable conditions of growth and lodging frequently occurs where crops are left for grain. Guyra is an indifferent variety for grazing and recovery since the early growth is relatively sparse and the grain yields, subsequent to grazing, only fair.

Fulghum.—The standard grazing and recovery oat, but is not a good general purpose variety as the straw strength is very poor. Fulghum is used principally for grazing and recovery since the notable length of its leafy growth phase prior to "shooting" enables it to be grazed later in the reason than other mid-season varieties. As a grazing oat the initial growth is not as vigorous as that of Dale but it is, however, very suitable for late winter or early spring feed.

The grain of Fulghum is suitable for oatmeal manufacture.

Dale.—This has given satisfactory results as a general purpose variety under a wide range of conditions. It is markedly superior to other mid-season varieties in respect to straw strength and is very suitable for early grazing.

Early Maturing.

Ballidu.—The standard early oat which has demonstrated its general superiority to Mulga in trials on research stations and is proving very satisfactory on farmers' holdings. The straw strength and grain yields are outstanding, whilst its vigorous leafy early growth and satisfactory recovery make it suitable for grazing and recovery.

Very Early Maturing.

Wongan.—The standard very early maturing oat which is notable for its vigorous early growth and strong straw. It is satisfactory as a hay variety although it is often rather short strawed. As a grain variety, it stands well but tends to shed if left unharvested too long after it has matured.

The vigorous early growth makes Wongan a suitable variety for early winter feed, but it cannot be grazed as late in the season as Ballidu and the mid-season varieties if recovery for grain is desired.

BARLEY VARIETIES.

Barleys are normally classified as being either two-row or six-row types and according to their suitability or otherwise for malting.

Suitable malting barleys are found both in the two-row and six-row types, but local maltsters' technique is based upon the use of the two-row types. Prior to the outbreak of war there was an expanding export of six-row malting types to the United Kingdom, but this has, owing to shipping and other difficulties, been temporarily suspended.

The selection of barley varieties for seed depends, therefore, upon the purpose for which the crop is to be grown. Practically all varieties in cultivation in Western Australia are early maturing and therefore the planting date will be dependent upon whether the crop is to be used for malting grain, fodder grain or green feed.

Barley for malting purposes is usually seeded during the latter half of May. When grown as a feed grain it is planted when convenient, usually after the wheat and oats have been sown. Barley for green grazing is customarily sown in April.

Description of the varieties available are:—

Atlas.—A six-row malting type barley introduced from California. It is also known in this State as Californian six-row barley. It is used in England for malting purposes in the production of light sparkling bottle beer and prior to the war exports of suitable samples were increasing substantially. This barley is also eminently suitable for green feed for which purpose it is at present mainly grown; a small quantity is used for malting locally in order to maintain a nucleus of the industry. It is very suitable also for feed grain purposes, being superior in yielding capacity to Cape. The results of trials with this typical six-row barley indicate that it is superior to oats as a source of early green feed, particularly at the time of the first grazing.

Prior.—A two-row barley which is the most important malting variety grown in the Commonwealth. Although it is generally considered that Prior is a strain of English Archer malting barley, there is no record of the variety from which it actually originated or the methods by which it was developed. This variety, which proved to be much more prolific and superior in malting quality to other malting barleys, was named after Mr. Samuel Prior, of Brighton, South Australia, who obtained one bag of seed of unknown origin from an Adelaide

seedsman in 1900. It was from this seed that the strain was developed, Messrs. Barrett Bros., maltsters of South Australia, being responsible for its initial distribution. Prior is also a useful variety for green fodder purposes.

Maltworthy.—Bred at the Roseworthy Agricultural College, South Australia, from a cross between Prior and Beavans Special. Maltworthy was named in 1939.

It is a two-row early mid-season maturing variety, which is strong strawed, and is superior to Prior in its resistance to strong winds when no occurrence of "necking" is evident.

Maltworthy possesses excellent yielding ability, and the malting quality of the grain appears to be satisfactory.

PURE SEED DISTRIBUTION.

The aim of the policy adopted with the distribution scheme for pedigree cereal seed is to provide as many farmers as possible with a few bags of the varieties grown by them and which are available from the Research Stations. The maintaining of "stud plots" by farmers is of major importance in the maintenance of the purity of their seed supplies and the small quantities of pedigree seed obtained by them is sufficient to establish such plots.

Objections have been raised from time to time by some farmers regarding the limiting of the quantity of each variety supplied to each applicant to a few bags only. If larger quantities were made available, however, it is possible that some farmers would not obtain any supplies of the varieties required by them for quite some years. Further, the Department grows quite a number of varieties for distribution and the actual quantity produced is limited by the area which it is possible to make available for planting at each station. Actually small quantities of each variety are quite sufficient to maintain pure seed supplies on the average farm. In this connection it is pointed out that each bag of wheat would sow at least four acres and each bag of oats or barley, three acres.

One objection raised quite often to small quantities is the extra trouble involved in harvesting small acreages; but where a farmer obtains regular supplies of the varieties he usually grows, there should be no difficulty or much extra trouble involved. With new varieties some extra work is, of course, involved but this could hardly be avoided with the introduction of a new variety on to a property and further, when new varieties are first distributed, the quantity available from the research stations is usually small in itself.

Requests are received from time to time that the pedigree seed be treated with a fungicide, for the control of ball smut, "pickling" as it is commonly termed, and in this connection it is pointed out that for a number of reasons it is not possible for this to be done. A considerable amount of work is involved in cleaning the grader between each variety, and if dusting was also included it would add to the difficulties of ensuring complete freedom from admixture.

All of the seed used on the Research Stations is dusted each year as a routine matter, copper carbonate is used for wheat, and a mercurial compound for oats and barley. Because of this the only danger of infection would be in transit after leaving the Research Station or on the farm before the seed is sown. Purchasers of pedigree seed from the Research Stations are advised that they could sow this seed unpickled with little fear of "bunt" or ball smut appearing in the crops. It should be remembered that untreated seed will run more freely than pickled seed.

With regard to the delivery of the seed every endeavour is made to have individual consignments forwarded as early as possible each year. However, owing to the large amount of work involved, it is not possible to consign any seed until March each year. Normally distribution, with the exception of late orders, is completed by the end of April at the latest.

In order to avoid disappointment in obtaining their requirements, farmers will assist considerably by noting the following directions:—

(1) All applications should be made direct to the Department of Agriculture, Perth.

(2) Applications should include the full name and postal address of the applicant and also the siding to which he desires the seed to be railed.

(3) Make early application.

(4) Forward cash remittance as soon as possible after receipt of statement of account. Statements of account are sent out in order of receipt of application.

(5) No definite reservations can be made until after receipt of the necessary cash remittance.

The cash prices per bag of three bushels for wheat, oats and barley, inclusive of rail freight to applicant's siding, will be:—

Wheat	35/-
Barley	30/-
Oats	20/-

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LICE AND TICK IN SHEEP

THE CONTROL OF TICK AND LICE IN SHEEP.

By C. R. Toop, Acting Chief Veterinary Surgeon.

OF the external parasites or vermin which infest sheep, the body lice and so-called ticks or keds are the most serious and unless steps are taken to control them by systematic dipping they may become a source of considerable loss to the flock owner.

The sheep body louse (*Damalinia ovis*) which is able to propagate under hot dry conditions has a wide distribution and occurs both in the agricultural and pastoral areas. The so-called tick or ked (*Melophogus ovinus*) has a much more restricted distribution and is confined to the higher rainfall areas of the South-West portion of the State.

Isolated cases of infestation with the sheep leg louse (*Linognathus pedalis*) also occur, but this parasite shows little tendency to spread throughout the flock and is consequently not of much economic importance.

Sheep infested with vermin show symptoms of skin irritation which causes them to rub against fences and other objects and to scratch and bite at the wool which in consequence presents a torn and ragged appearance. In heavy infestations the wool becomes matted and discoloured and is thereby depreciated in value. In addition the constant irritation of the parasites may result in considerable loss of condition and a reduction in the weight of the wool produced.

Sheep infested with louse and tick Note torn and ragged condition of fleece, due to rubbing.

Tag of wool in mouth of sheep pulled out in its effort to get at the irritation.

For the detection of these parasites the wool should be opened and examined in a good light. Ticks, on account of their reddish-brown colour and relatively large size, are unlikely to be overlooked and when present will usually be found on the lower parts of the body, i.e. the belly, flanks and underside of the neck.

Lice are much smaller, measuring only 1/25 inch in length but their movements in the fleece will readily be detected when a close examination is made in a bright light.

A detailed description of these parasites is contained in the portion of this article which has been contributed by the Government Entomologist.

Wool on neck of infested sheep parted, showing ticks and pupae.

CONTROL BY DIPPING.

Dipping Fluids.

Vermin infestation in sheep may be controlled by systematic dipping. There are many reliable brands of sheep dip on the market and while none of these are specifically recommended by the Department all of them may be expected to give satisfactory results when used in accordance with the directions of the manufacturer. The choice of a dip, however, will depend upon the parasite it is desired to control, and in this connection it should be recognised that a dip which is effective against one type of parasite will not necessarily control another.

Recent research has shown that while arsenical dips are highly effective for the control of body lice, they cannot be relied upon to destroy tick. Conversely derris (*rotenone*) dips while destroying ticks are not effective for the control of body lice. Dips containing both arsenic and derris will of course, control both of these parasites.

Gammexane (*benzene hexachloride*) and DDT dips are similarly effective for the control of both tick and lice and in addition they possess a residual toxicity due to the retention of particles of the dip in the wool which should destroy any of the parasites which subsequently emerge. Both of these preparations, however, suffer a disadvantage in that they tend to "strip" or become reduced in strength during use and this is most likely to occur when a small volume of fluid is used for the treatment of a large number of sheep as in a shower spray or in a dip of small capacity. Allowance for this reduction in strength has, however, been made by the manufacturers when calculating the amount of dip which should be added to the bath to maintain the dipping fluid at an effective concentration and it is essential that directions supplied both with regard to the mixing and topping up or replenishment of gammexane or DDT dips should be strictly observed if satisfactory results are to be obtained.

For the control of leg lice, gammexane dips are recommended and may with advantage, be used at double strength, though this is not essential.

These recommendations may be summarised as follows:—

Body Lice—use arsenical gammexane or DDT dips.
Tick—use derris, gammexane or DDT dips.
Tick and Body Lice—use arsenic and derris, gammexane or DDT dips.
Leg Lice—use a gammexane dip.

Time of Dipping.

Best results will be obtained by dipping immediately after shearing. Recent investigations have shown that the closer to shearing that dipping is carried out the more effective it will prove to be. In order to avoid infection or the absorption of arsenic through open wounds, however, it is advisable to delay dipping until shear-cuts have healed. It may be noted, however, that under station conditions many thousands of sheep are dipped off the board without suffering any ill effects.

When it is realised that the majority of the parasites present in the fleece will be removed by shearing and those that remain will be more vulnerable to the effects of the dipping fluid while the wool is short the advantages to be gained by early dipping will be apparent.

The Stock Diseases Act Regulations require that sheep shall be dipped within six weeks of the date of shearing.

Eradication.

Although a single annual dipping will effectively control both tick and lice a second dipping carried out after an interval of about three weeks is necessary in order to completely eradicate these parasites from a flock. This will destroy any ticks or lice which have emerged from pupæ or eggs which have been unaffected by the first dipping. Due to its residual toxicity a single dipping only should be necessary to effect eradication when a gammexane or DDT dip is employed.

Careful Dipping is Essential.

Care should be exercised to ensure that the dip is of the correct strength and that the sheep are completely immersed. All sheep on the property (including lambs) should be dipped at the one time since any animals that are left undipped will soon re-infect the remainder of the flock. The capacity of the bath should be accurately estimated and the dip should be added in the proportions directed by the manufacturer and thoroughly mixed. The bath should be of sufficient length to ensure that the sheep will be completely immersed and saturated with

the dipping fluid and the head of each animal should be ducked beneath the surface as it swims through the dip. Where shower sprays are employed the sheep should be held long enough to ensure that all parts of the fleece are thoroughly saturated. When unsatisfactory results are obtained from dipping they can usually be attributed to failure to observe these precautions.

More detailed information with regard to dips and dipping is given in the succeeding paragraphs contributed by the sheep and wool adviser.

Dipping is Compulsory.

Under the Stock Diseases Act Regulations dipping is compulsory in the South-West division of the State as well as in the Dundas, Esperance, Westonia and Yilgarn Road Districts and those portions of the Merredin, Narembeen, Lake Grace and Phillips River Road Districts, situated outside the South-West Division. This legislation is necessary to ensure that tick and lice are controlled on individual properties and its purpose is to prevent the spread of vermin from infested to clean properties by the sale of undipped sheep. Systematic dipping connotes good sheep husbandry and on well managed properties it is practised as an annual routine, making compulsion unnecessary.

There are still many farmers and graziers, however, who are unmindful of the losses occasioned by the presence of vermin in their flocks and are indifferent to the losses that may be sustained by others from the indiscriminate sale of infested, undipped sheep. The enforcement of the dipping regulations is, therefore, essentail. A copy of these regulations has been appended for the information of sheep owners.

DIPPING FOR ERADICATION OF TICK AND LICE IN SHEEP.

W. L. McGARRY, Sheep and Wool Adviser.

THE complete eradication of tick and lice in flocks will pay handsome dividends in the form of more and better wool and healthier and heavier sheep.

If sheep are to thrive and be profitable they must be cared for, and regular and efficient dipping is an essential step in the welfare of the sheep.

Infested wool clinging to wire fence after sheep have been scratching.

A thorough dipping each year will keep sheep free of tick and lice. Evidence that this is not being done by some growers is revealed by an inspection of clips on show floors and examination of sheep at various sales.

The wool from infested sheep is discoloured, matted and usually has a bedraggled appearance due to the rubbing and scratching in an effort to relieve the skin irritation set up by the parasites. This fault in the wool considerably reduces the value of the clip.

Loss in Value.

At present prices a loss of up to 1s. per pound is sustained where a good type, good length, 64/60's quality agricultural wool carries a light infestation. A similar wool heavily infested would be reduced in value up to 1s. 6d. per pound. In addition to this severe loss, the constant irritation worries the sheep and causes a loss in condition and a reduction of fleece weights.

Summarised, infested sheep result in:—

(1) Less wool at a lower price.

(2) Less meat at a lower price.

Type of Dip.

Dipping can be carried out by running the sheep through a swim bath and by the use of shower or spray dips. Plans and specifications of swim dips in use at Agricultural Research Stations can be obtained upon application to this Department, and particulars of this type of dip are printed herewith. Plans and specifications of various types of swim and spray dips can also be obtained from stock firms.

Community dips could with advantage be erected to serve areas where flocks are small and or where the cost of installing individual dips and draining yards is considered excessive.

A diagram of a side entrance to a swim dip which combines the slide-in principle is printed herewith.

Dipping Precautions.

In order to receive the maximum benefits from dipping a clean muster is absolutely essential. Only one infested straggler can, in time, cause the whole flock to be reinfested, and failure to achieve a clean flock after dipping, often attributed to various reasons, is actually the result of neglect in this direction.

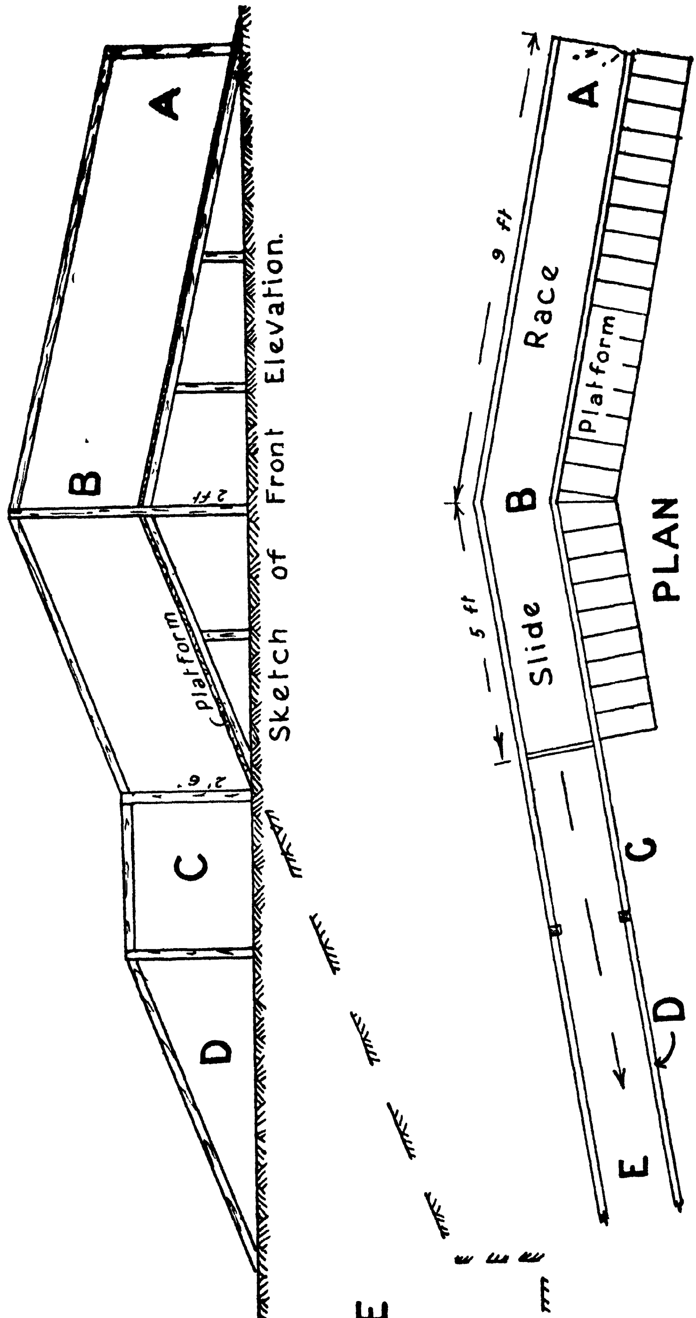
It is necessary to dip all the sheep and lambs, including ration sheep, at the same time unless arrangements are made to keep the dipped and undipped sheep strictly separate.

It is necessary to carefully follow the dip-maker's instructions on the packet or tin when preparing and using the dip.

Weather.

Do not dip in wet or very cold weather or in the hottest part of the day or under a broiling sun. Finish dipping early enough in the day to enable the sheep to dry out before sun-down. If heavy rain falls upon newly dipped sheep before they are dry, they will scald and mortality can occur. It is necessary to provide shade for the sheep whilst in the draining pens, because sheep that are soaked with dip fluid are liable to be scalded under a very hot sun.

DIAGRAM OF SIDE ENTRANCE OF SWIM DIP COMBINING THE "SLIDE IN" PRINCIPLE.

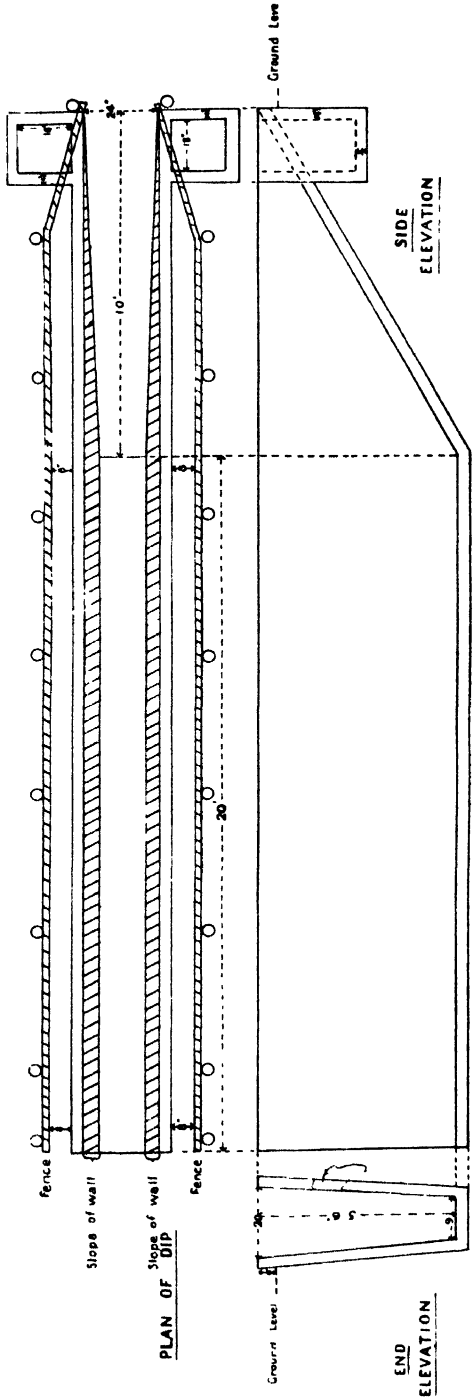


The 9ft. race A forms an obtuse angle with the 5ft. slide at B so that the sheep do not see the splash until they round the turn, by which time they are on the slide.

The Race A.—This is 9ft. long and rises from ground level to 2ft. above ground level at B. Sides are 2ft. 6in. high. Width of race 1ft. 4in. Floor of race is battened for first 3ft. A platform is provided for men to work sheep up race.

The Slide.—This is 5ft. long and falls 2ft. from B to bath. Floor of slide is plain galvanised iron. A piece of sack could be hung across slide about 2ft. from commencement is desired. C and D.—Continuation of sides of race at start of bath if desired E.—Bath.

It is not beneficial to the welfare of the sheep and there is a risk of scalding if they are turned out into the hot sun or wind or driven immediately they come out of the draining pens. This should be avoided and whenever possible always allow the sheep to shade-dry in preference to sun-dry before they are driven any distance.


Ground Level
SIDE ELEVATION
10'
20'
Fence
Slope of wall
Slope of wall
Fence
PLAN OF DIP
5' 6"
Ground Level
END ELEVATION

Plan of dip.

Condition of Sheep.

Do not dip hot or thirsty sheep; yard them near the dipping site some time before dipping and allow the sheep time to rest and settle down and thoroughly cool off before commencing operations.

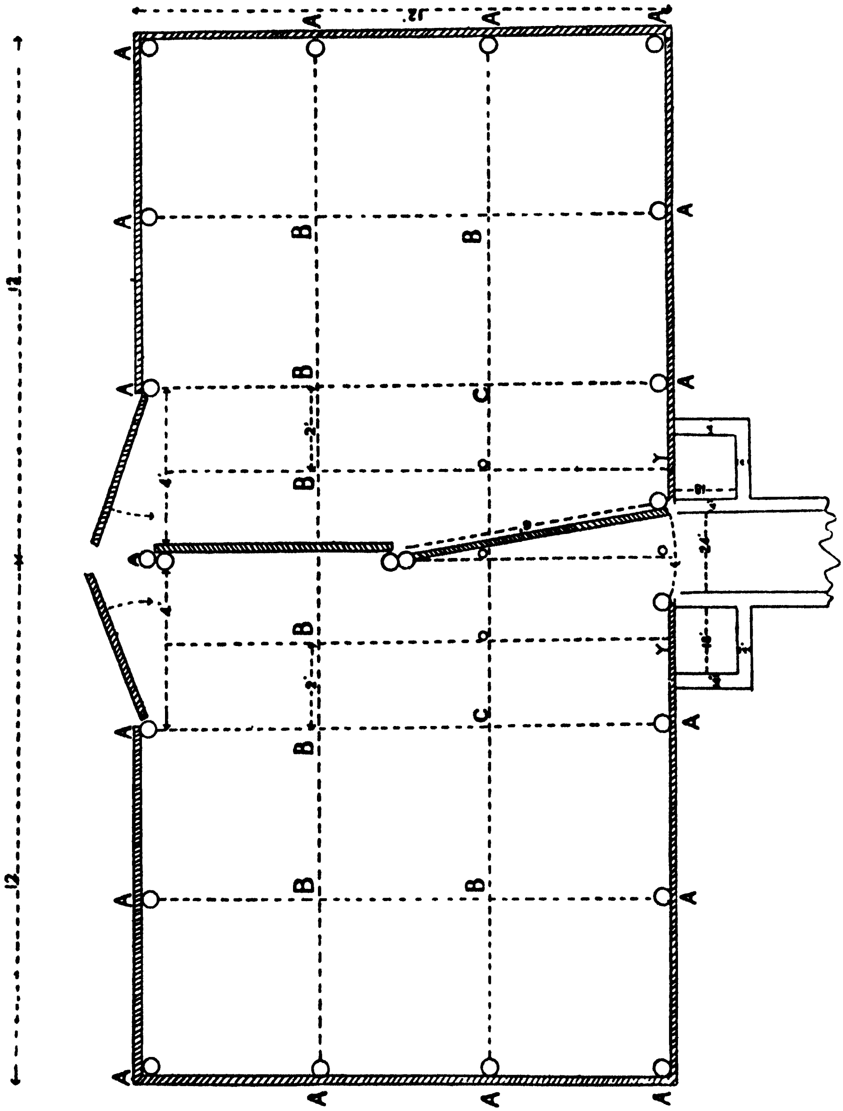


Fig. 18.—Plan of draining pens for sheep dip.

Sheep must not be driven immediately before or after dipping. If the sheep are over-driven or shedded after dipping there is a risk of scalding of the skin due to "sweating."

Sheep in poor condition are more susceptible to infestation than sheep in good condition, therefore good husbandry in this respect is important.

The fouling of the wash will be reduced if the sheep are as free as possible from dung, etc., when dipped.

Immersion.

To secure the best results from dipping the operation must be efficiently carried out and a thorough saturation of the wool is essential. This will not be achieved if the sheep are hurriedly rushed through the bath or spray. The sheep *must* remain in the bath or spray long enough to be thoroughly soaked to the skin. For this reason particular care is required when it becomes necessary to dip sheep carrying a fair growth of wool or when using short swim dips which are not recommended.

In swim dips it is necessary to plunge the sheep's head under twice with a guiding crutch, and the second plunge should be given just before the sheep reaches the exit slope. Always allow breathing time between the plunges and never hold a sheep under. When plunging the sheep always push them backwards. The sheep, particularly weak ones, should always be handled carefully.

When to Dip.

The entire flock should be dipped a few days after shearing is completed when the shear cuts will have healed.

Under station conditions dipping straight off shears is necessary.

Late dipping should be avoided. Late dipping can result in discolouration, lack of brightness and break in the wool which reduces the value per lb. When late dipping is unavoidable and the sheep are carrying a good growth it is necessary to reduce the dip strength.

Reinfestation.

No dip will protect sheep indefinitely after dipping and for this reason it is important to guard against reinfestation.

Reinfestation of clean sheep can be caused by:—

- Failure to secure a clean muster for dipping.
- The practice of not dipping lambs and dipping lambs, etc., at a different time from the dipping of the general flock.
- Careless neighbours.
- Failing to dip ration sheep.
- Purchase of outside sheep that are infested.
- Proximity to roads and travelling stock routes.
- Boundary fences that are not sheep-proof.

SOME EXTERNAL PARASITES OF SHEEP.

C. F. H. JENKINS, Government Entomologist.

WITH the exception of blowflies, "tick" and lice are the most important pests affecting sheep in Western Australia. The term "tick" is quite misleading, as the true sheep tick does not occur in this State and the so-called "tick" of Australian graziers is a wingless fly which should be more correctly referred to as the Sheep Ked.

The lice are true insects with flattened bodies and strongly clawed legs admirably adapted for living amongst the sheep's wool.

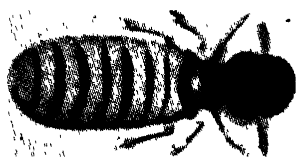
Two types of lice occur locally, one having a broad squarish head and biting mouth parts and the other possessing a more pointed head and tubular mouth parts adapted for sucking blood. Both "tick" and lice are permanent parasites, all stages in the life cycle being passed through on the body of the host.

The Red-headed Sheep Louse (*Damalinia ovis* Schr.)

This is the common sheep louse in Western Australia. It is generally distributed throughout the South Western Division of the State and extends northwards—where its distribution is chiefly coastal—to about Port Hedland.

The insect measures about 1/25th of an inch in length. The abdomen is a pale brownish colour with several dark transverse bands. The reddish head is more densely pigmented, giving rise to the popular name of the parasite.

The mouth parts of this louse are adapted for feeding on the scurf and other debris lying on the surface of the skin. The situations most favoured are the neck, shoulders, back and thighs, but in severe infestations the insects spread to almost all parts of the body.



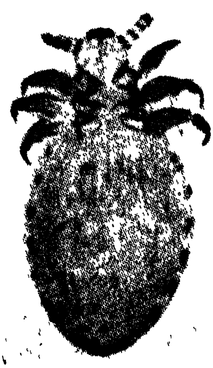
Red-headed Sheep Louse.
× 50.

Life History.

The eggs or "nits" of the Red-headed Louse are fastened on to the wool and hatch in from six to 10 days. The young closely resemble the parents in all but size, and after moulting or casting their skin several times reach sexual maturity in about 18 days. The adult female is said to lay 100 or more eggs.

The Foot Louse (*Linognathus pedalis* Osb.).

The Foot Louse is much larger than the Red-headed Louse, measuring about 1/12th of an inch in length. It has a short bluntly pointed head and mouth parts adapted for the sucking of blood. As its name infers, this species of louse is found chiefly on the hairy parts of the legs, but may spread to adjacent parts of the body.



× 50 Male.

Sheep Foot Louse.

× 50 Female.

The Foot Louse is not common in Western Australia and has a very scattered distribution. Its permanent habitat seems to be in the vicinity of Carnarvon and other isolated Gascoyne localities. Records from South-West districts have been received, but usually such infestations have been traced to the introduction of sheep from northern stations.

The life history of this louse differs only in detail from that of the Red-headed Louse.

Portion of wool from fetlock showing masses of louse eggs or "nits."

The Sheep Ked or "Tick" (*Melophagus ovinus* L.).

As stated earlier in this article, the so-called sheep tick of local farmers and pastoralists is really a wingless fly. The true tick is an eight-legged creature, whereas the Sheep Ked has the six legs typical of insects. On account of its high

specialisation as a parasite, the wings have been lost, although there are close relatives of the Sheep Ked which parasitise birds and various wild and domestic animals in which wings are present. These flies are often known as louse-flies.

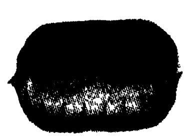
The Sheep Ked measures about ¼ inch in length and is reddish or grey-brown in colour. The abdomen is disproportionately large and swollen, especially when the insect is well gorged with blood. The mouth parts are adapted for blood sucking, and protrude as a conspicuous "proboscis" in front of the head.

When disturbed the keds move very rapidly through a fleece, darting sideways and backwards at will very much like a crab. The neck, breast, shoulders, belly and thighs are the favoured locations on the host.

The Sheep Tick—Female.
× 13.

Life History.

The eggs of the Sheep Ked are retained by the female until they hatch, and the larvae or maggots are not deposited until fully-grown. They are then attached to the wool fibres and immediately pupate. The entire life cycle is, therefore, passed on the sheep and yet no eggs or active maggots will be seen on an infested



Pupa of Sheep Tick.

animal. The keds emerge from the brown barrel-shaped pupae in about 22 days and reach sexual maturity after a further fortnight or three weeks. A single female ked is considered to be capable of producing about fifteen pupae.

Means of distribution and survival capacity of Lice and Keds.

Lice and keds never voluntarily leave the body of the host animal and are incapable of breeding or surviving long periods away from their normal environment. The adult ked, however, has been reported to live as long as 18 days detached from the sheep, and pupae have been recorded to survive as long as 42 days in tags of wool.

The survival period of lice detached from the host is usually given at about five days, but this will naturally vary according to whether the insect is exposed in a paddock or protected in a shearing shed.

From the foregoing it will be apparent that sheep may become infested in two ways. Close contact between clean and infested sheep in yards, trucks and shearing sheds probably contributes mostly to the spread of the pests, but the danger of tags of wool lying about shearing shed floors and adhering to the sides of sheep pens cannot be ignored.

To summarise these aspects, therefore, it is apparent that both lice and tick do not customarily survive long periods away from their hosts. On the other hand, individuals may exist for several weeks and so the contamination of shearing sheds, paddocks, trucks, etc. by sheep which have already passed on cannot be ignored.

In the case of lice a stock free period of about a month has been recommended to ensure complete decontamination of shearing sheds, paddocks etc. after infested sheep; for the "tick" or ked the safety margin has been placed at two months.

Effect of Lice and Ked infestation on sheep.

The presence of lice and keds can be detected by the scraggy and ragged appearance of the infested animals. The irritation caused by the feeding of any of the parasites greatly disturbs the stock and causes them to be constantly scratching, biting or rubbing the affected areas. In the case of blood-sucking foot louse and ked infestations, the actual loss of blood involved also helps to weaken the host. Affected sheep rapidly lose condition, and the standard of the fleece is adversely affected.

Prevention and Control.

Control measures are outlined elsewhere in this article and the importance of carrying out these measures regularly and carefully cannot be over emphasised. Every farmer, however, should strive to keep his flock entirely free of tick and lice, and the most effective way of doing this is to see that infested animals are not brought on to the holding.

Fresh purchases should be carefully examined before being given a free run of the property, as prompt action in connection with a few head of stock may often prevent widespread trouble later in the season.

STOCK DISEASES ACT REGULATIONS.

PART VI.—SHEEP AFFECTED WITH TICK AND LICE.

Dipping or spraying of sheep compulsory in specified areas.

63. (1) Subject as hereinafter provided and unless otherwise authorised by the Chief Inspector of Stock, every owner of sheep within the boundaries of the Districts specified in paragraph (2) of this regulation, shall within six weeks after

the date of shearing dip or cause to be dipped in a swim bath or saturated by a shower spray approved by the Chief Inspector of Stock, and prepared from some specific known to be fatal to tick and lice all sheep running upon land whereof he is the owner or occupier.

(2) This regulation shall apply to the South-West Division of the State to the Dundas, Esperance, Westonia, and Yilgarn Road Districts as constituted under the Road Districts Act, 1919-1946, to all those portions of the Merredin, Narembeen, Lake Grace and Phillips River Road Districts situate east of the No. 1 Rabbit Proof Fence, and to any other such Road District which may subsequently be specified by a notice published in the *Government Gazette*.

Penalty for having affected sheep on property.

64. (1) If any sheep affected with tick or lice shall be found upon any property on which sheep are grazed, the owner or occupier of the land on which the affected sheep are depasturing shall be guilty of an offence, and any Inspector may give notice to the aforesaid owner or occupier of the land on which the affected sheep are depasturing forthwith to dip, spray, or dress the sheep in such manner and at such place as the Inspector of Stock may direct, and every such owner or occupier who refuses, neglects, or fails to comply with the aforesaid notice, shall be liable to a further penalty.

(2) No sheep affected with tick or lice shall be offered for sale privately or by auction or removed from the property on which the sheep are being depastured until they have been dipped in or sprayed with some specific known to be fatal to tick and lice, provided that permission may be granted by the inspector to remove them to an approved dipping or spraying place.

Sheep infested with tick or lice must be dipped or sprayed.

65. (1) If an Inspector is satisfied that stock depasturing in any part of the State is affected with tick or lice, he shall give the owner thereof notice to dip or spray such stock forthwith to the satisfaction of the Inspector or his agent. And any owner who refuses, neglects, or fails to comply with such notice on or before the date specified therein shall be liable on conviction to a penalty not exceeding fifty pounds for the first offence, and if immediately after conviction for the first offence such stock shall not be dipped or sprayed to the entire satisfaction of the Inspector, such owner shall upon conviction be liable to a further penalty not exceeding fifty pounds, and so on for each and every succeeding conviction.

(2) If any sheep affected with tick or lice shall be found in any pound, or in any yard or yards or on any land or other place at which sheep are offered for sale or exhibited for show purposes, the owner exposing the sheep so affected shall be liable to a penalty not exceeding fifty pounds, and any Inspector, if he deems it necessary, may order the withdrawal from sale of any sheep affected with tick or lice until such sheep have been dipped, sprayed, or dressed to the satisfaction of such Inspector or any other Inspector, and may give notice to the aforesaid owner of such sheep to dip, spray, or dress the same forthwith, at such place as the Inspector may direct, and every such owner who refuses, neglects, or fails to comply with the aforesaid notice shall be liable to a further penalty not exceeding twenty pounds.

But if the Inspector is satisfied that such sheep are intended for immediate slaughter, he may withhold such notice to dip or spray.

66. Every owner, occupier, or person in charge of any holdings in the South-West Division of the State shall, before the removal of any stud sheep, make a Statutory Declaration, according to Form No. 5 in the Third Schedule

hereto, that such sheep are free from tick and lice. If such sheep are found to be suffering from tick or lice, such owner, occupier or person in charge shall cause them before removal to be dipped in a swim bath or saturated by a shower spray, approved by the Chief Inspector of Stock and prepared with some specific known to be fatal to tick and lice, and shall make a Declaration, according to Form No. 6 in the Third Schedule hereto, that they have been so dipped or sprayed.

Statutory Declaration to be Supplied within fourteen days after dipping or spraying.

67. Within fourteen days after the dipping or spraying of his sheep the owner shall make a Statutory Declaration before a Justice of the Peace, to the effect of Form No. 7 in the Third Schedule hereto, stating that he has dipped or sprayed his sheep in accordance with the provisions of these regulations, the date of dipping of spraying, the number of sheep dipped or sprayed, and the class of dip or spray used, and he shall forward such declaration to the Chief Inspector of Stock.

Ewes with Lambs—Time for dipping or spraying.

68. Not withstanding anything contained in these regulations, it shall not be necessary to dip or spray ewes affected with ticks or lice during such time previous to or after lambing as the Inspector may appoint, and for such purposes any Inspector may, in respect of such ewes, extend any notice to dip or spray for such time as he shall think fit.

Affected Stock not allowed to Stray.

70. Every person who by himself, his agent or servant, drives, without the permission of an inspector, or suffers to stray across or upon any land, or drives, depastures, or suffers to stray upon or along any highway any sheep which have not been dipped according to these regulations, or which are affected with ticks or lice shall be liable on conviction to a penalty not exceeding fifty pounds.

Form No. 5 (Regulation No. 66).
Western Australia.

Department of Agriculture.

The Stock Diseases Act, 1895.

DECLARATION.

I,(1) ...

of(2) ...

in the State of Western Australia(3) ...

do solemnly and sincerely declare that ... stud sheep

now on my holding, which stud sheep I have sold to ...

... of ...

are free from TICK AND LICE.

And I make this solemn declaration by virtue of Section One hundred and six of "The Evidence Act, 1906."

Declared at ...
this ... day of ... 19 ,
before me, } (4) ...
...
Justice of the Peace.

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(1) Christian name or names and surname of declarant in full.
(2) Address.
(3) Calling.
(4) Ordinary signature of declarant.

(To be forwarded to the Chief Inspector of Stock.)

Form No. 6 (Regulation No. 66).
Western Australia.

Department of Agriculture.

The Stock Diseases Act, 1895.

DECLARATION.
(No. 28 of 1906.)

I,(1)
of(2).
in the State of Western Australia(3)
do solemnly and sincerely declare that ... stud sheep which were sold by me to
of , and which were found by me to be suffering from Tick (or Lice), were within
of their removal from my holding dipped in or sprayed with (state material used)

in the proportion of (quantity of dip or spray used and how diluted)

Declared at

this day of 19 ,

before me, (4)

Justice of the Peace

(1) Christian name or names and surname of declarant in full.
(2) Address.
(3) Calling.
(4) Ordinary signature of declarant.

(To be forwarded to the Chief Inspector of Stock.)

Form No. 7 (Regulation No. 67).

Stock Diseases Act, 1895.

DECLARATION.

I, , of ,
situated in the Road District in the State of Western Australia, do solemnly and sincerely declare that I have dipped or sprayed the whole of the sheep at present depasturing on my farms and runs, and belonging to me, and at present in my possession.

No. of sheep dipped

Brand and Quantity of Dip used

Date of Dipping / /19

And I make this solemn declaration by virtue of section one hundred and six of the Evidence Act, 1906.

Declared at

this day of 19 ,

before me,

*Justice of the Peace or other authorised person.

Ordinary Signature of Declarant.

Pursuant to section 2 of Act No. 12 of 1913, the following persons are authorised to attest Statutory Declarations:—Town Clerk, Secretary to Road Board, Electoral Registrar, Post Master, Classified officer of State or Commonwealth Public Service, Classified State School Teacher, Member of Police Force, Commissioner of Declarations.

EXPORT OF WESTERN AUSTRALIAN FRUIT

An Account of a Non-refrigerated Shipment of Oranges, Apples and Tomatoes to Singapore.

H. R. POWELL, Superintendent of Horticulture.

A VISIT to Singapore aboard the M.V. "Charon" which left Fremantle on the 5th November, 1947, provided an opportunity to collect weather data and other information bearing on the out-turn of a non-refrigerated shipment of fresh fruit. Through the courtesy of Mr. E. H. Lewington, Shipping Manager of Dalgety & Co., agents for the Blue Funnel Line, and the Master of the Vessel, Captain Marriott, every facility was provided to enable the necessary information to be obtained.

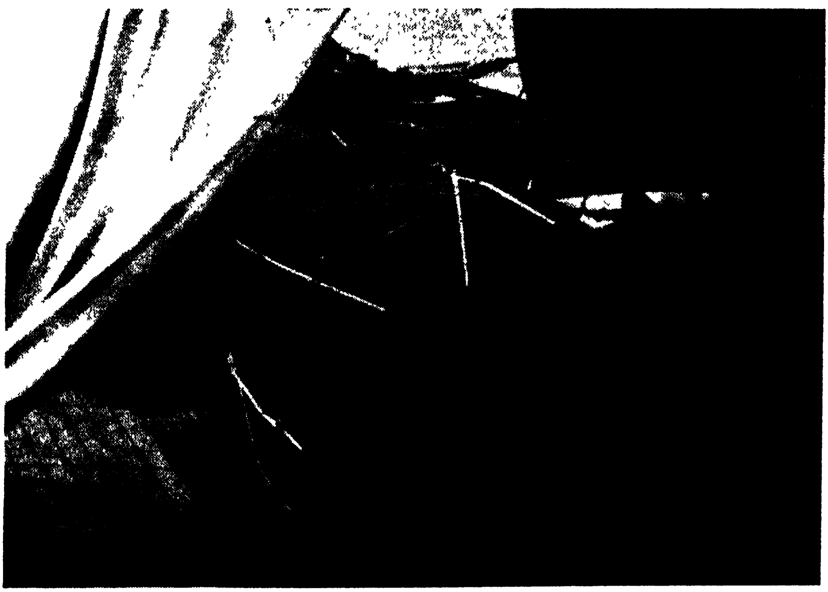


Plate 1.—Deck stowage on the M.V. Charon. The fruit is well protected from damage by heavy rain. In the upper left and right hand corners appear portions of the canvas wind chute used to ventilate sheep and fruit in the lower and upper cattle decks. (Photo by H. R. Powell.)

The fruit cargo loaded at Fremantle consisted of 2,422 bushel cases of Valencia oranges and 100 cases of Granny Smiths, stowed on deck and 1,018 cases of Valencias, 27 cases of lemons, and 100 cases of Granny Smiths stowed in the No. 1 'tween deck. The No. 1 'tween deck was loaded on the 3rd November and No. 2 and No. 4 decks on the 4th. At Geraldton 1,066 half bushel cases of tomatoes were loaded as deck cargo.

It was realised that it was too late in the season for commercial non-refrigerated shipments of apples but the Granny Smiths were made available by the Superintendent of the State Committee of the Apple and Pear Marketing Board (Mr. R. M. Carter) for the purpose of obtaining regular pulp temperatures

and other information. The apples consisted of a range of sizes including 2¼ inch, 2½ inch and 2¾ inch, and were divided into two lots each of 100 cases, consisting as far as possible of fruit of similar quality and size range.

Owing to unforeseen circumstances it was not possible as originally planned to inspect the fruit prior to loading and obtain a range of pulp temperatures.

Through the kindness of the Weather Bureau and the Mt. Barker Co-operative Ltd., two bimetallic thermographs and a hair type hygrograph were made available. In addition an alcohol pulp thermometer, two wet and dry bulb hygrometers, and a mercury thermometer graduated to 260°F. were used. The thermometer and thermograph were checked prior to sailing.

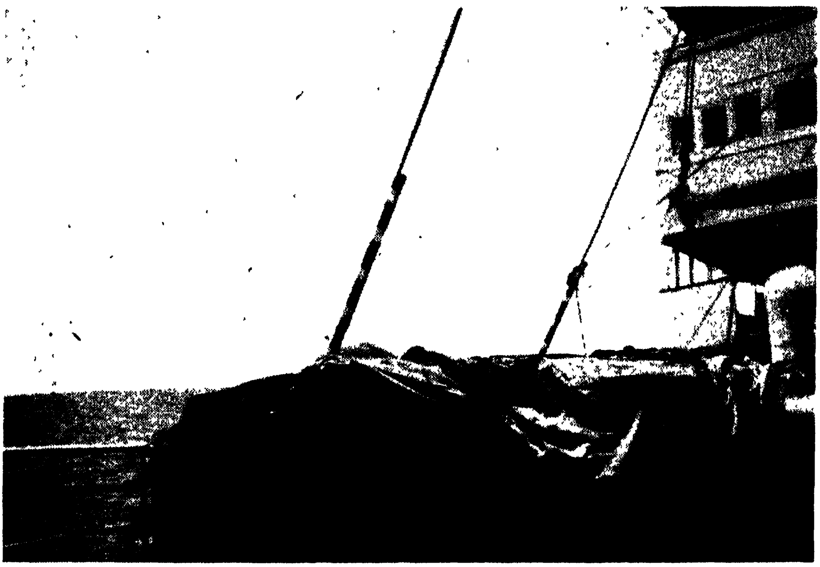


Plate 2.—Deck stowage on the M.V. Charon.
(Photo by H. R. Powell.)

A continuous record of temperatures was obtained during the voyage, also at Singapore, and during the return trip to Fremantle on the M.V. "Gorgon," altogether a period of approximately five and a half weeks. Unfortunately, the records from the hygrograph are incomplete owing to the movement of the vessel affecting the mechanism of the instrument.

The fruit was stacked partly on deck and partly in 'tween decks. On deck the oranges were split into four stacks of which two, each comprising 800 cases, were loaded forward on the port and starboard sides. The rest were stowed in two stacks aft. One hundred cases of apples were included in one forward deck stack, while the tomatoes were divided between the four stacks. Resting on dunnage, the cases were loaded five high mostly on their sides and covered by trapaulins which left only a few cases on the rails and around the base of the stacks exposed.

The fruit carried in the 'tween deck consisting of 1,018 cases of oranges and 100 cases of apples was block stacked eight cases high on dunnage between two open hatches with passage ways on three sides.

Deck Temperatures.

Temperatures were recorded on two thermographs placed in the cabin on the promenade deck and on the starboard orange stack in the 'tween deck, as well as by thermometer readings taken at intervals during the day at various points.

Table 1 sets out the range of temperatures encountered after leaving Geraldton at 6.30 a.m. on Friday, 7th November. The points selected for checking temperatures were as follows:—

(a) Shade—Forward deck.

(b) Shade—After deck.

(c) Shade—'Tween deck.

With the exception of the 'tween deck figures which are averaged from three readings, the other figures are the average of two readings. There were occasions when it was impossible to take readings at the correct time and these variations are shown on the table.

The weather at Perth prior to departure, was relatively cool. Maximum and minimum temperatures as recorded by the Weather Bureau were as follows:—

	Max. F.	Min. F.
Tuesday, 4th November	71°	56°
Wednesday, 5th November	79°	52°

Temperatures rose steadily after leaving Geraldton, the hottest period being encountered after leaving Onslow between Monday 10th and Friday 14th when shade temperatures ranged at noon from 83° to 86°, forward, and from 83° to 91° aft. Thereafter until Singapore was reached on the morning of the 17th, cooler conditions prevailed.

Many variable factors affected temperatures in the 'tween deck during the voyage, such as the force and direction of the wind, the use of the canvas wind chute and subsequent unequal distribution of the fresh air, the sheep, and the proximity of the crew's quarters, etc. Differences as great as 5° were noted between various points.

No facilities for mechanical ventilation of the fruit in the cattle deck were available. The hatch covers were removed during the voyage, and this coupled with the fact that the cattle ports were open ensured the movement of air through the stack of fruit, whilst the necessary favourable winds were available. A canvas wind chute rigged up well above the open hatch, was used for three days after leaving Broome on the 12th November, to provide additional ventilation. Heavy rain and rough weather experienced from the 15th November, until Singapore was reached made it unnecessary for it to be used again.

After leaving Broome the weather experienced on this particular voyage was characterised by strong winds and rain. It could be expected however, that on many occasions in these tropical areas the weather would be hot and humid with little, if any, wind. On these occasions the use of the wind chute could not provide sufficient ventilation.

A system of forced air circulation would be an insurance against unfavourable weather conditions and would benefit both the fruit cargo and livestock carried.

Figure 1 sets out graphically the average temperatures obtained at various points at each reading during the period 10th-14th November. This period is taken as insufficient data was collected either before or afterwards.

TABLE 1.

SHADE TEMPERATURES, NOVEMBER, 1947.

Date.	Cabin.					Forward Deck.					After Deck.					'Tween Deck.				
	9 a.m.	12 noon.	3 p.m.	6 p.m.	9 p.m.	9 a.m.	12 noon.	3 p.m.	6 p.m.	9 p.m.	9 a.m.	12 noon.	3 p.m.	6 p.m.	9 p.m.	9 a.m.	12 noon.	3 p.m.	6 p.m.	9 p.m.
7th	65	67	72	72	....	..	71	72	69		....	75	73	..	....	....	71	71	70	....
8th	69	71	74	75	77*	71	.	76	75	75*§	75	..	79	76	...	70	..	75	75	75*§
9th	75	74	77	77	75	79	78	....	77	74§	79	...	.	78	...	72	73§	75	.	74§
10th	75	76	78	79	78	79	83	79	78	77	83	83	80	78	77	76	78	78	79	78
11th	81	...	83§	...	81†	84	.	87	.		85	.	87		...	82	.	82	.	.
12th	83	82	82	83	81	86	83	82	81	81	89	87	86	82	...	83	81	81	81	80
13th	82	83	83	85	84†	85	86	86	83	83†	87	91	87	85	83	82†§	83	83	84	83†§
14th	81	83	84	84	82†	80	86	85	83	81†§	82	89	88	86	81	79†§	83	79	81	80†§
15th	78	78	79	79	81†	76	...	77	78	79†§	78	77	..	..	80	78†§		76	77	79†§
16th	79	80	81	82††	83†	...	81	81	...	..	.	81	84	..	.	77	79	80	.	..

* 10.0 p.m. † 10.30 p.m. †† 7.30 p.m. § Single readings.

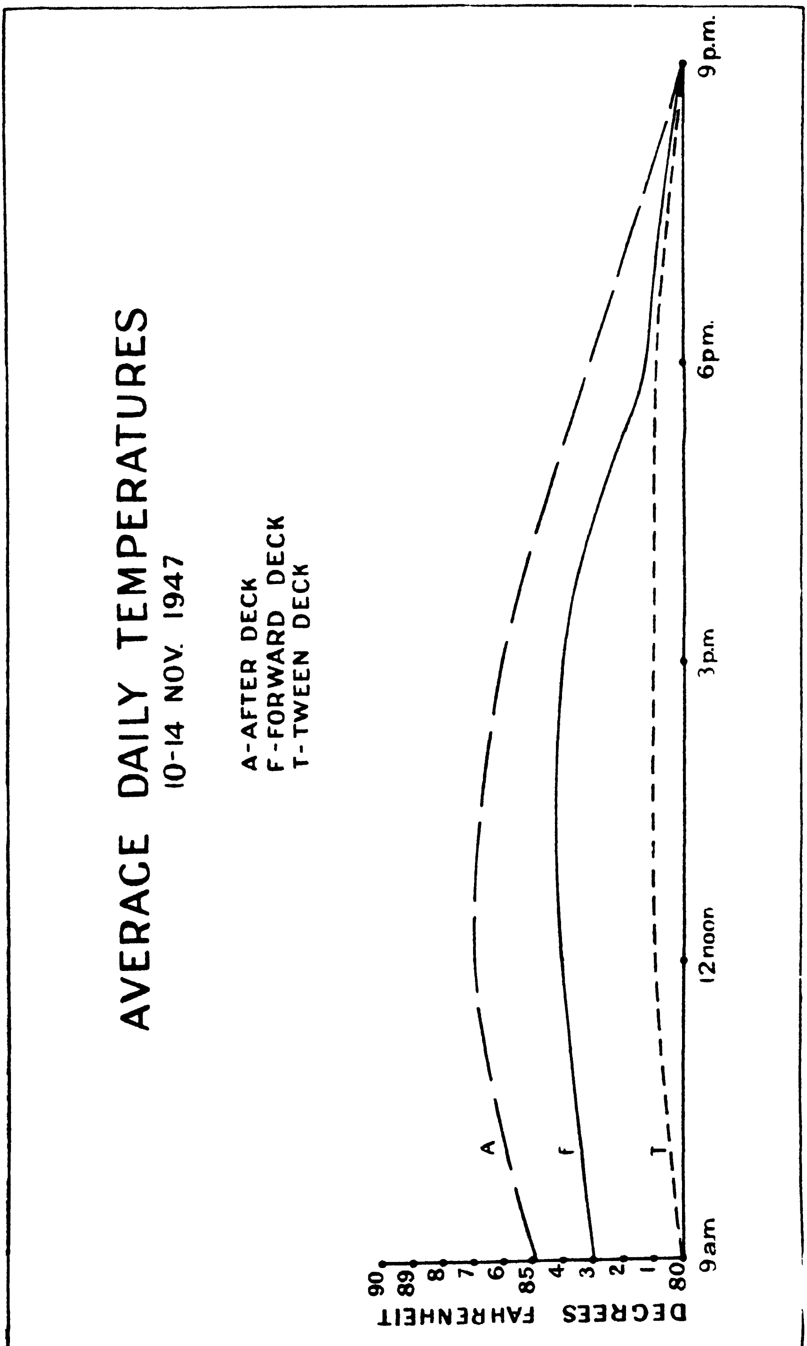


Figure 1.—Average daily shade deck temperatures.

The average shade temperatures on the forward deck were generally 2° cooler than the average temperatures on the after deck, except at noon when the difference was 3° and from 6 p.m. onwards the temperatures, on both decks tended to equalise at approximately 80°.

The average 'tween deck temperatures were lower than those recorded on the forward deck. With the exception of 6 p.m. onwards, when temperatures on both decks tended to equalise at about 80° the difference in favour of the 'tween was approximately 3°.

To sum up, during the period 9 a.m. to 3 p.m. average 'tween deck temperatures were approximately 5° lower than those recorded on the after deck, and 3° lower than the forward deck. After 3 p.m. each day all temperatures tended to equalise, and by 9 p.m. a uniform average temperature of approximately 80° was reached.

Pulp Temperatures.

From the 12th November regular daily pulp temperatures were taken of the apples and oranges. On deck the top and middle layer of a case of apples situated just under a black tarpaulin were checked as well as the next case directly underneath. In the 'tween deck a case of apples and also a case of oranges were used. Table 2 sets out the results obtained, and these are graphically illustrated in Figure 2.

TABLE 2.

PULP TEMPERATURES (F).—APPLES—GRANNY SMITHS.

10.0 a.m.

	Forward Deck (Starboard).				'Tween Deck.		
	Shade Temp. 9 a.m.	Top Layer Top Case.	Middle Top Case.	Case Middle Underneath.	Shade Temp. 9 a.m.	Middle Top Case.	Oranges.
Friday 7th		73	67	65	.	65	..
Saturday 8th	71	72	70	66	70	70	..
Sunday 9th	79	75	73	71	72	73	....
Monday 10th	79	75	73	71	76	73	.
Tuesday 11th	84	80*	80*	78	82	78	...
Wednesday 12th	86	95	89	85	83	83	82
Thursday 13th	85	92	85	85	82	84	83
Friday 14th	80	86	85	85	79	85	83
Saturday 15th	76	83	83	83	78	82	80
Sunday 16th	....	80	80	80	...	81	80
Average	....	81	78	77	....	77	82

*Beyond capacity pulp thermometer.

As perhaps could be expected, the highest temperatures were recorded in the top layer of the top case which was directly underneath the tarpaulin. The pulp thermometer was used until the 11th November, when some of the temperatures exceeded the capacity of the instrument, and thereafter a mercury thermometer was substituted. It will be seen from the table that there was a gradual increase in the temperature from 73° on the 8th to 95° on the 12th which was the highest temperature recorded. Towards the end of the voyage temperatures tended to equalise at about 80° due to cooler weather conditions.

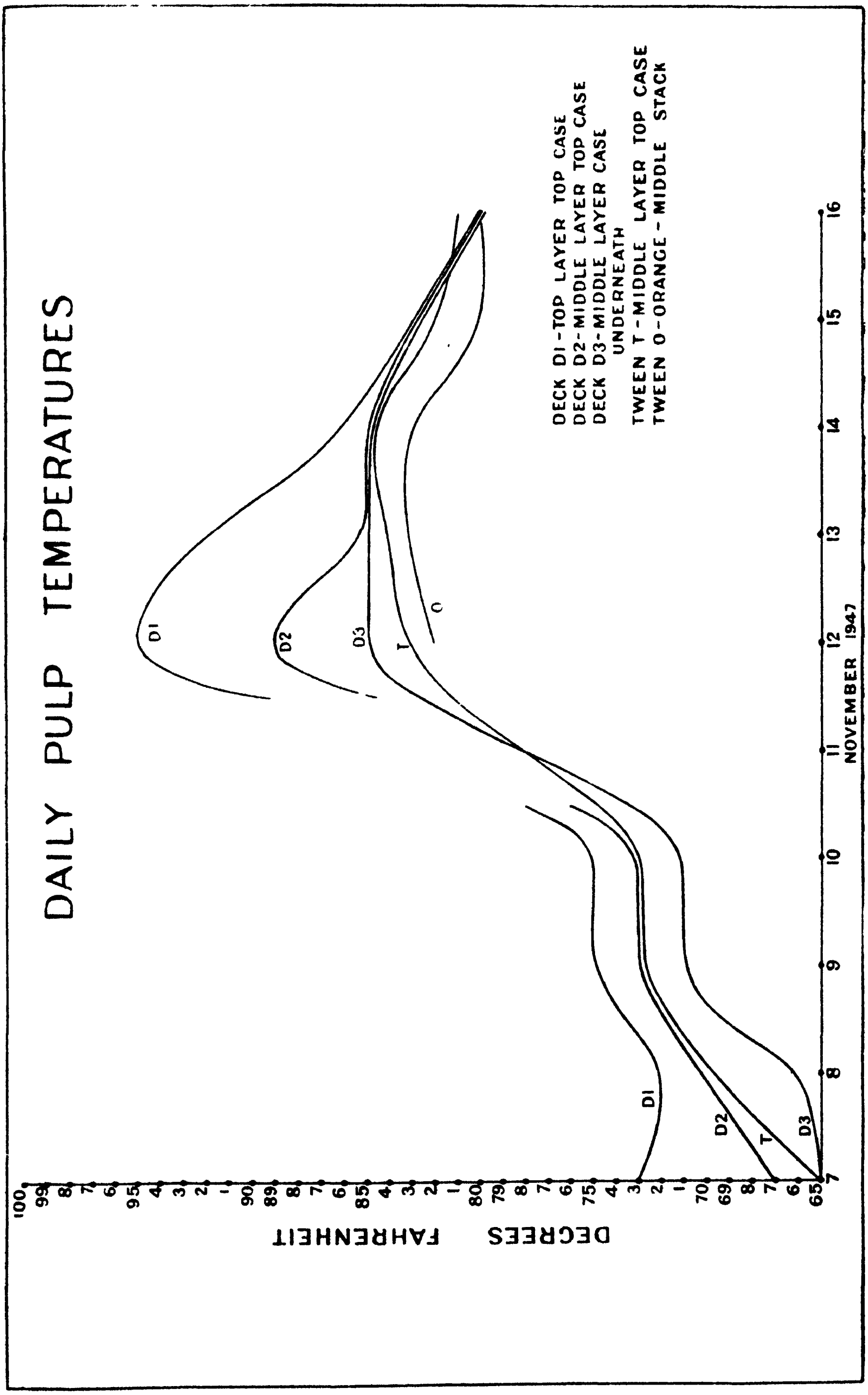


Figure 2.—Pulp temperatures of apples and oranges.

The apples in the middle of the top case were also quickly heated, but not quite to the same extent as the top layer, and this applied to a lesser extent to the case underneath. Average pulp temperatures during the period were as follows:—

(a) Top case—top layer .. .. 81°
(b) Top case—middle .. .. 78°
(c) Case underneath .. .. 77°

Temperatures on the 11th were above the limits of the thermometer and, therefore, could not be included in the average figures for (a) and (b). It is estimated, therefore, that the true figures would be one degree higher.

From Figure 2 it will be seen that the highest temperatures were recorded on Wednesday 12th. The temperature of the apples in the top layer of the top case was 95° or 6° higher than fruit in the middle layer of the case and 10° higher than apples in the middle layer of the case underneath. Subsequently pulp temperatures declined until on the day before berthing all three were in the vicinity of 80°.

In the 'tween deck the average pulp temperature of the apples in the middle layers of a top case of the stack was 77°. Daily temperatures, however, did not rise beyond 85°, and this figure was reached on Friday 14th, three days prior to berthing. Thereafter readings gradually declined to approximately 81°.

Stack Temperatures.

As all fruit on deck was covered directly with tarpaulins with no air cushion between the top cases and the coverings, an attempt was made to ascertain some of the temperatures experienced in various positions of the stacks. The readings were taken each morning at 11 a.m. and the results as set out in Table 3 indicate that very high temperatures were experienced, particularly on four occasions. As could be expected these were recorded directly under the tarpaulin on top of the orange stack, the highest reading being 120°. The direct effect of the sun was also experienced in front of this stack. Temperatures taken elsewhere were not so high and indicate, with support from the pulp temperatures of the apples, that the fruit not directly heated by the sun through the coverings was not subject to such high temperatures. On a portion of the front of the stack a stained white covering was used. On the 14th temperatures under both coverings were tested—the black was 107° and the white 94°.

TABLE 3.

FORWARD DECK STACK TEMPERATURES (STARBOARD).

11.0 a.m.

	Front Orange Stack Under Tarpaulin Top.	Front Orange Stack under Tarpaulin Bottom.	Behind Apple Stack under Tarpaulin Bottom.	Behind Tomato Stack under Tarpauiin Bottom.
Monday, 10th	104	88	85	85
Tuesday, 11th .	120	102	92	89
Wednesday, 12th	92	82	82	85
Thursday, 13th . ..	115	90	84	85
Friday, 14th	107	83	83	84

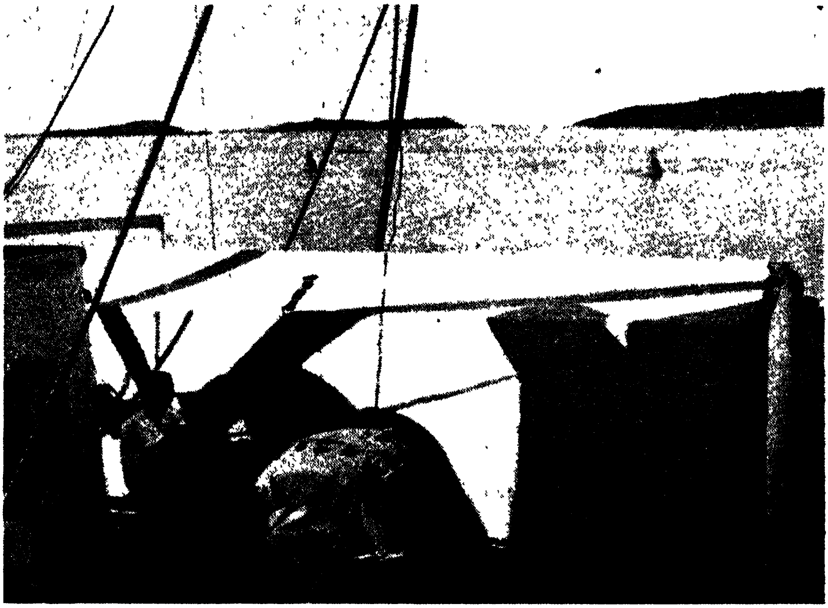


Plate 3.—Showing improved deck stowage, using a metal framework covered with tarpaulins.
(Photo by A. G Strickland)

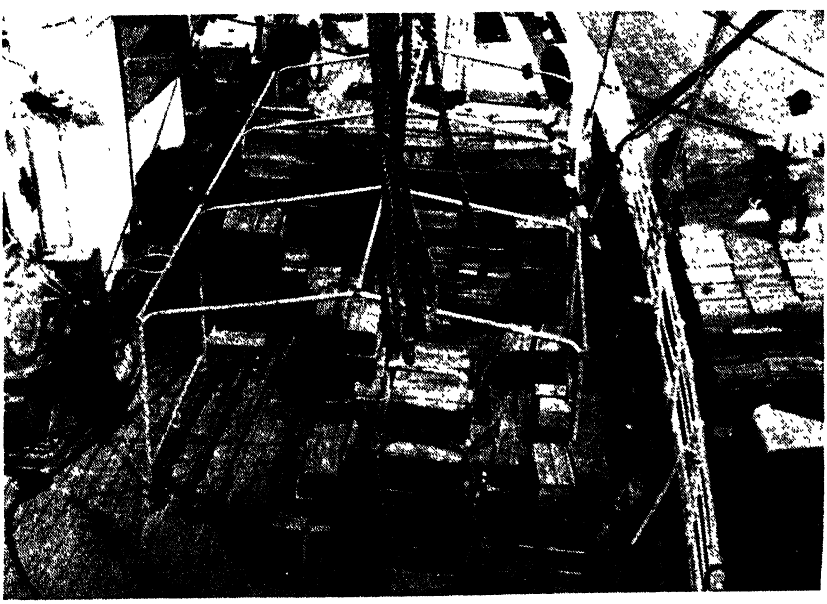


Plate 4.—Showing the method of stacking cases under the framework.
(Photo by A. G Strickland.)

It can be mentioned that the uncovered sections of the deck stacks, particularly aft, were subjected to the direct rays of a very hot afternoon sun for days. Sun temperatures would be in the region of 120°. Oranges were

exposed particularly through the crevices caused by bulged lids. Wet weather experienced towards the end of the voyage prevented a close inspection of fruit in this and other sections.

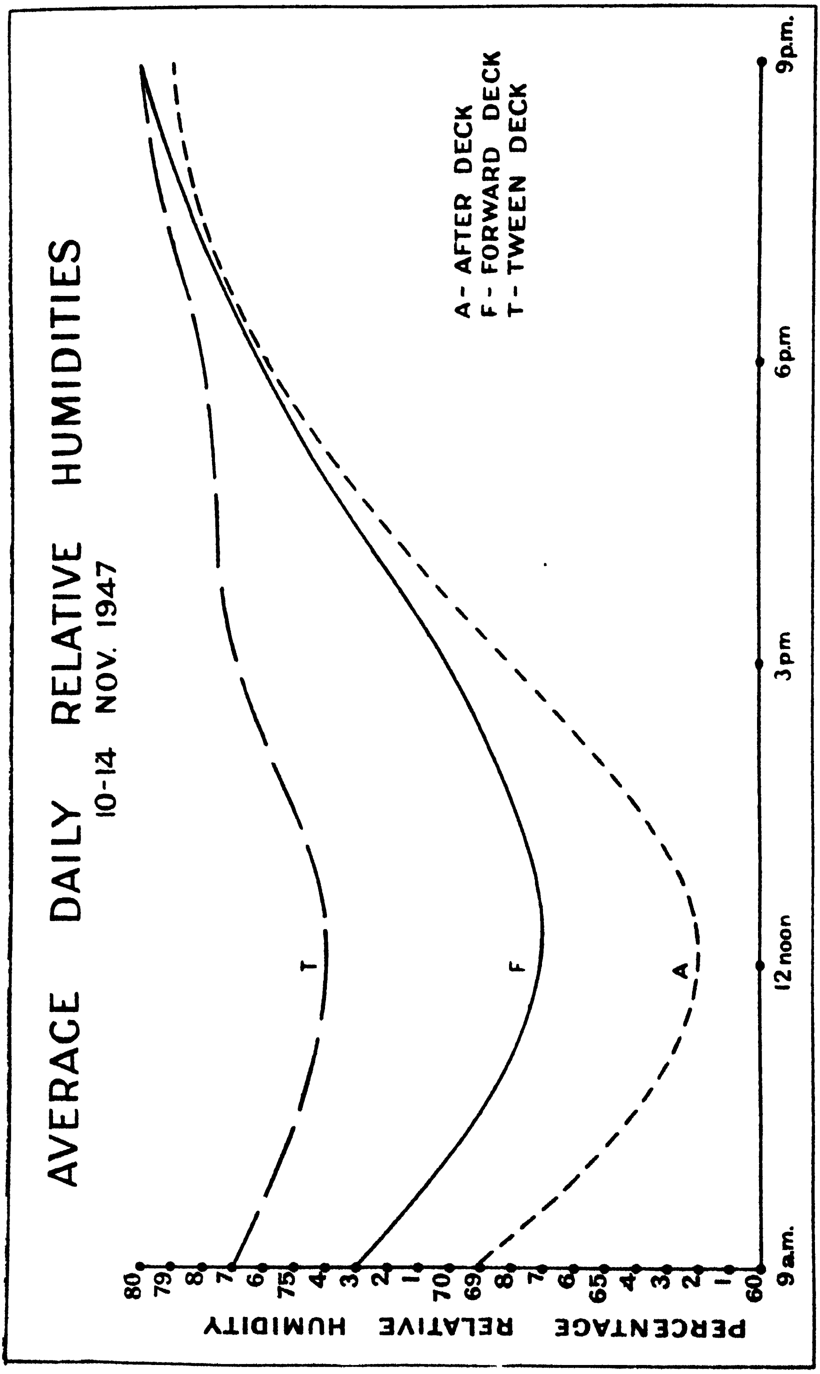


Figure 3.—Average daily relative humidity readings on deck.

The cases stowed in front of the stacks on the forward deck and those on the rails, particularly forward, were subjected to some wetting by sea spray and rain. During fine weather the coverings on the sides of the stacks, were lifted.

The method used during the voyage for covering the deck stacks is illustrated in Plates 1 and 2. However, following representation to the shipping company, light metal frameworks have now been installed for supporting the tarpaulins as shown in Plates 3 and 4, which have been kindly made available by Mr. Strickland. An air space between the cover and the fruit is thus provided to eliminate excessive heating of the outside cases, while all fruit is given complete protection against direct sunshine and sea spray.

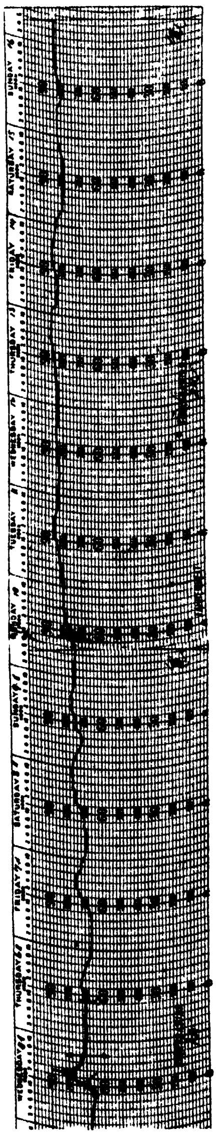


Figure 4.—Thermograph—Tween deck temperatures—M.V Charon.

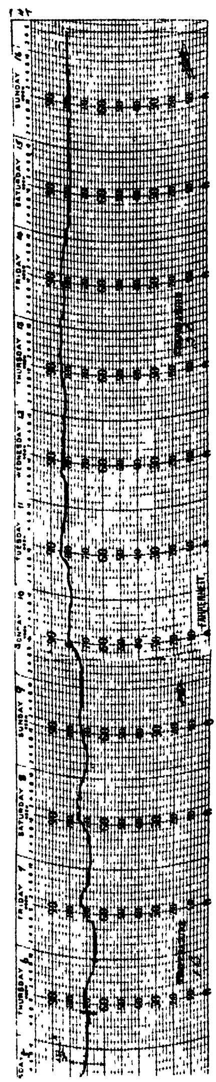


Figure 5.—Thermograph—Cabin temperature—M.V. Charon.

Continuous Temperature Records.

Thermographs situated in the 'tween deck and cabin respectively gave continuous records of temperature fluctuations in these positions during the voyage. Graphs were also taken at Singapore and on the return voyage. Reproductions of these records are included in Figures 4, 5, 8, and 9.

Until the 9th when the vessel left Onslow there was a difference of 6°-10° between maximum and minimum daily temperatures. Thereafter the graphs tend to straighten out showing less difference between maximum and minimum temperatures. During the last two days, when unsettled weather was encountered, the difference between 'tween deck maximum and minimum temperatures was 2°-3°. Cabin temperatures, as could be expected, were more variable, but even so the variation was only in the region of 4°.

The two sets of graphs show only slight differences over the whole period—cabin temperatures were generally higher by 2°-3°.

Humidity.

Throughout the voyage relative humidity readings were regularly taken. A suitable position could not be found in the 'tween deck for the hygrograph but wet bulb readings were taken at the same times and positions as were the dry bulb readings. Table 4 sets out the results which are illustrated in Figure 3.

On Friday the 7th November, after leaving Geraldton, relative humidities were generally low, ranging from 52 per cent. to 59 per cent. on deck and from 62 per cent. to 69 per cent. in the 'tween deck. Subsequently a gradual increase took place until on the 15th the figures for all positions exceeded 80 per cent. all day. The highest reading was 86 per cent. recorded on Saturday 15th, on the forward deck at 9 a.m., 'tween deck at 3 p.m., and the after deck at 6 p.m.

During the day time the 'tween deck figures were greater than those on the other decks. For instance, at 12 noon the average 'tween relative humidity was seven per cent. higher than the forward deck and 12 per cent. higher than the after deck. At the other times, average 'tween relative humidities exceeded the other recordings as follows:—

	Fore. %	Aft. %
9 a.m.	4	8
3 p.m.	7	9
6 p.m.	2	2
9 p.m.	equal	1

The relative humidity graphs show a converse trend to the temperature graphs. The after deck, which recorded the highest average day time temperatures, experienced the lowest daytime relative humidities. The forward deck, was intermediate with regard to temperatures, was also intermediate with regard to relative humidities.

After 9 a.m. each day average relative humidities, in all three positions, declined until noon and then gradually rose throughout the afternoon and evening. At 9 p.m. the average for each of the three decks was approximately 80 per cent.

The average relative humidity figures for all positions were as follows:—

	%
9 a.m.	73
12 noon	68
3 p.m.	72
6 p.m.	77
9 p.m.	80

TABLE 4.

RELATIVE HUMIDITIES, 7TH TO 16TH NOVEMBER, 1947.

Date.	Cabin.					Forward Deck.					'Tween Deck.					After Deck.				
	9 a.m.	12 noon.	3 p.m.	6 p.m.	9 p.m.	9 a.m.	12 noon.	3 p.m.	6 p.m.	9 p.m.	9 a.m.	12 noon.	3 p.m.	6 p.m.	9 p.m.	9 a.m.	12 noon.	3 p.m.	6 p.m.	9 p.m.
7th	63	64	63	63	.	.	55	59	58		...	62	63	69	...	.	52	57	..	...
8th	75	71	72	77	65*	71		65	74	68*§	75		71	77	72*§	64	...	62	71	...
9th	56	72	65	78	68	52	66		76	72§	66	76§		80	72§	51	.		71	..
10th	77	78	78	78	86	70	65	76	80	86	78	78	78	84	85	59	60	74	82	84
11th	83		75	.	83†	76	..	65			78		72		.	70	.	63	.	..
12th	79	75	79	75	83	70	71	75	79	83	74	76	77	79	83	66	63	69	75	.
13th	75	75	75	72	76†	68	67	66	75	77†	75	74	75	76	79†§	67	63	69	76	79†§
14th	78	79	76	76	75†	80	67	68	69	74†§	78	70	82	73	74†§	81	61	64	70	74†§
15th	82	82	82	82	74†	86			82	78†§	85		86	.	78†§	82	.		86	79†§
16th	78	83	74	79††	75†		79	74			84	78					.	73		..

* 10.0 p.m. † 10.30 p.m. †† 7.30 p.m. § Single readings.

A study of the cabin hygrograph record for the period 10th to 15th November, shown as Figure 6, reveals a divergence from the general information, but cannot be regarded as being accurate as this type of instrument is not considered reliable. The highest humidity recorded was 93 per cent. between 6 a.m. and 7 a.m. on Saturday, 15th November. During the first two days the peak occurred between 10 p.m. and 7 a.m. The lowest figures were recorded round mid-day. During the last three days the graph is erratic.

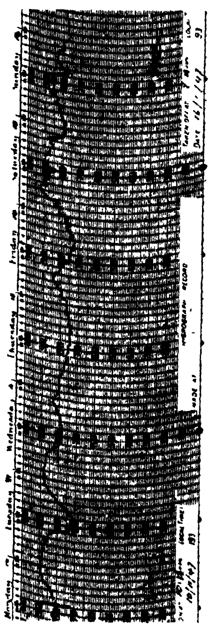


Figure 6.—Hydrograph—Cabin relative humidities—M.V. Charon.

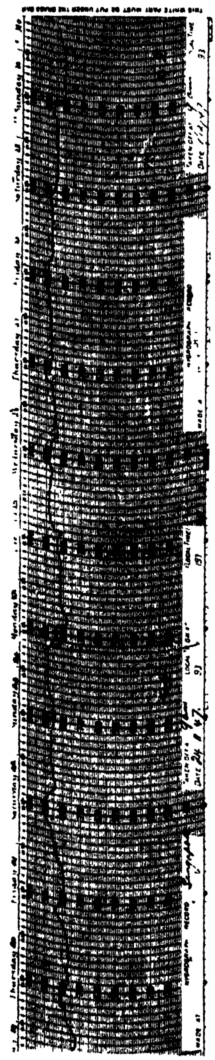


Figure 7.—Hydrograph—Conditions in Singapore.

Weather Data.

Though the courtesy of the First Officer, Mr. Vaughan, data covering wind force and direction were supplied.

Until the 8th when Onslow was reached, the vessel was sailing approximately due north. Thereafter to Broome the general direction was north-east. Broome was reached early a.m. on the 11th and departure for Singapore was made the following morning. The general direction taken to Singapore was then north-west.

Fairly good cross winds were experienced during most of the voyage, except towards the end when strong north-west head winds were encountered. The fruit stowed in the 'tween deck would be benefited by the ventilation provided by the passage of air through the open cattle ports.

Condition of Fruit.

Regular inspections of fruit were made during the voyage for the purpose of noting deterioration of any kind.

Several cases of Granny Smith apples, both in the 'tween deck and on the forward deck, were examined each day for the purpose of ascertaining the development of physiological disorders.

The chief defects which developed were:—Scald, yellowing and core flush.

Signs of scald in association with slight sunburn injuries were noticed on the second day after leaving Fremantle. The disorder progressively developed during the voyage and subsequently all fruit affected with sunburn became badly "scalded." Apples unaffected with sunburn did not scald.

The development of yellow colour was rapid with 2¾ inch apples, and to a lesser extent with the smaller sizes. The day following discharge of the fruit in Singapore the 2¾ inch were mostly YYY, the 2½ inch mostly GYY and 2¼ inch GY to GYY. The colour of the fruit in cases sampled was green when first seen.

The first signs of core flush were seen six days after leaving Fremantle and it developed steadily throughout the voyage. The larger sizes were most susceptible but the 2¼ inch in some instances were equally affected.

From examination of the orange stacks, odd oranges affected with mould, were noticed through the crevices of the cases in all parts of the ship where the fruit was stowed. During the last week of the voyage a few ullaged cases in the 'tween stack were inspected each day and apart from slight mould infection, the fruit maintained its good condition.

Lemons stowed in the 'tween, starboard side near the crew's quarters rapidly deteriorated due to mould infection. They were seen on the wharf subsequently and were in a very poor condition.

The stacks of tomatoes were watched for development of colour. They were loaded green: on arrival they were mostly GY with pink colour showing in a few instances.

Pulp temperatures of tomatoes taken at Geraldton averaged 72°F. Heavy rain on the last day of the voyage precluded a general inspection of the fruit cargo as had been planned with the ship's officers.

Conditions in Singapore.

During the period I was in Singapore the weather was warm and humid and heavy rain fell on a number of occasions. The average rainfall is 95 inches and average monthly falls vary between 6.62 inches and 10.55 inches. In the Cameron Highlands the average is 110.57 inches a year and the monthly falls range from 3.28 inches to 15.39 inches; the months of lowest rainfall are February, May, June, July and August.

Thermograph records of the temperatures experienced in the Hotel bedroom for the period 19th November to 5th December are shown in Figure 8. These temperatures provide some evidence of the conditions under which fruit is discharged from the ships in Singapore harbour and held in common storage on dealer premises at this time of the year.

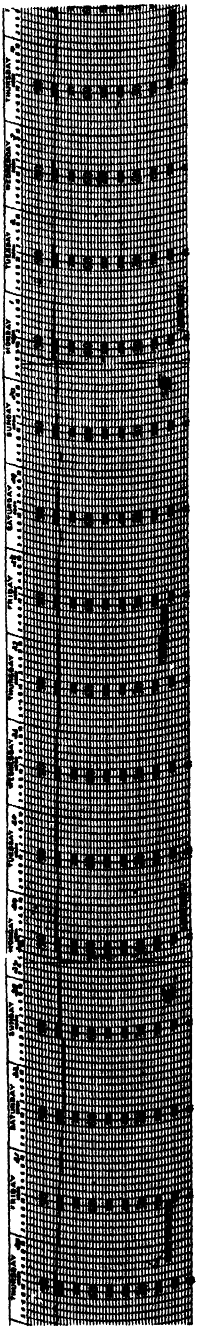


Figure 8.—Thermograph—Singapore temperatures.

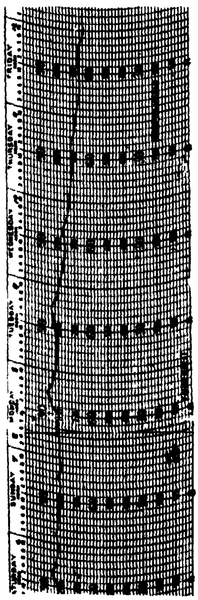


Figure 9.—Thermograph—Cabin temperatures—M.V. Gorgon.

It will be noticed that the average temperature was approximately 80°F day and night over the whole period. Daily fluctuations did not exceed 4°F On some occasions maximum and minimum day-time temperatures did not vary by more than 1°F.

The hygrograph was also set up in the Hotel bedroom and the records for the period 19th November to 1st December are shown in Figure 7.

The range of relative humidities recorded over the period was 23 to 91 per cent. with an approximate average of 85 per cent. Peaks occurred mainly between 9 a.m. and midday.

The readings were checked with a hygrometer each day, and it was found that the hygrograph records were generally 6 per cent. higher than the readings obtained by the wet and dry bulb thermometers.

Thermograph records are shown in Figure 9 of the temperatures experienced in the cabin on the return voyage to Fremantle on the M.V. Gorgon—6th December to 13th December.

The highest temperature was 86°F on the 8th December. Thereafter there was a gradual decline until Fremantle was reached on the 13th December when the temperature was 64°F.

ACKNOWLEDGMENTS.

On board ship every facility for collecting the necessary information was provided by Captain Marriott and Mr. Vaughan, the First Officer. Mr. Lewington by his interest and co-operation enabled the necessary approaches to be made to the Captain of the vessel.

Mr. J. Hogan, of the Weather Bureau, was particularly helpful and by his constructive criticism of the draft some errors were rectified.

Mr. T. C. Miller of the Department also materially assisted in obtaining the equipment, in making suggestions as to how the information was to be collected and by helpful discussions of the assembled data.

Appreciation is expressed for the service rendered by Mr. F. Melville in assisting with the preparation of this article for publication.

INFLUENCE OF MONTH OF CALVING ON PRODUCTION.

OFFICIAL PURE BRED HERD RECORDING.

R. A. BETTENAY, Agricultural Adviser.

IN a recent Journal (Vol. XXV No. 4, Dec. 48) the average production of cows tested under the Dairy Herd Improvement Scheme, according to month of calving, was shown. This study emphasized the importance of freshening cows during the five monthly period from March to July under the normal system of management practised with grade herds in this State whereby the cow relies largely on pasture as a source of supply of food materials and little feeding of concentrates is carried out. The present article records the results of a similar study of the production records of cows tested under the Official Australian Pure Bred Dairy Cattle Recording Scheme.

Testing under this scheme was commenced in 1918 so that production records are available for the thirty-two years 1918-49 inclusive. In this study the thirty-two year period was initially divided into the four sub-periods 1918-29, 1930-39, 1940-44, and 1945-49 in order to determine any changes that had been made over the whole period.

The State was divided into four arbitrary divisions as follows:—

(a) METROPOLITAN—extending from Pinjarra in the South to Gingin in the North and Eastwards to include Wooroloo.

(b) SOUTH WEST—extending Southwards from Pinjarra and Eastwards to include Nornalup.

(c) SOUTH COASTAL—including Albany, Denmark and surroundings.

(d) GREAT SOUTHERN and WHEATBELT—a large district comprising those parts of the State not included in a, b or c.

Further, the three breeds Jersey, Guernsey and A.I.S. were considered separately, so that the investigation included four sub-periods of time, four districts and three breeds, or a total of forty-eight subdivisions.

All lactations of 150 days or more were included in the averages. It became apparent as the study progressed that so much subdivision was not warranted due to the small number of cows freshening in some months, and to the very great variation in production of individual lactations. (Range between greatest and least lactation over 600 lb.)

To increase the numbers in each subdivision the three breeds were combined since it was apparent that any trend in total production according to month of calving was very similar for each of the three breeds. The subdivisions of time were then combined to two periods 1918-39 and 1940-49 since there appeared to be no definite trend over the years.

Production according to month of calving in each of the four districts being considered is shown in Table 1 together with the number of lactations on which each average is based. A further column combines the four districts to give an average production according to month of calving for all purebred cows tested in this State. The same results are shown in different form in Graph No. 1.

It will be observed from Table 1 and the accompanying graph that there is no very definite trend in monthly production throughout the year. In individual districts there is often considerable variation between the production in one month and the next and this may be explained as caused by the large variation between individual lactations and the comparatively small number of lactations in the averages. There is, however, in districts *a*, *b* and *c*, a tendency for production in the months January, February, November and December to be lower than in the intermediate months. In district *d*, (Great Southern and Wheatbelt) month of calving appears to have had no significant effect on production. The difference between districts *a*, *b* and *c*, on the one hand and district *d* on the other may be due to a greater feeding of concentrates in the latter district which is outside of the true dairying zone. It would also suggest that within the limits set by breeding, food supply is the important factor in determining total production and that other environmental conditions such as temperature are seldom limiting under conditions which exist in the South-West of this State. This is further borne out by the results obtained in certain individual herds where excellent production is obtained from cows freshening in all months of the year.

GRAPH No. 1.—PRODUCTION ACCORDING TO MONTH OF CALVING—COMPARISON OF DISTRICTS.

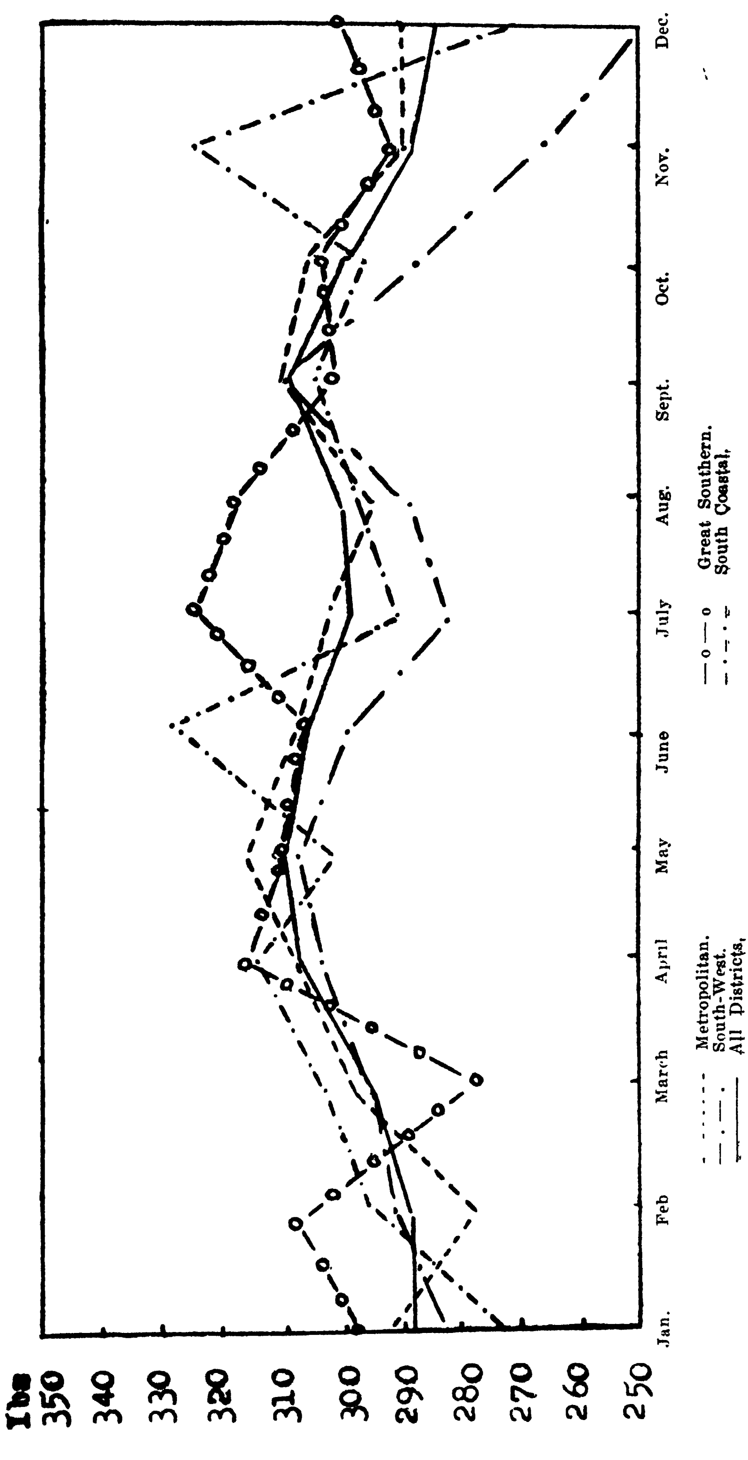


TABLE 1.

AVERAGE PRODUCTION ACCORDING TO MONTH OF CALVING BY DISTRICT.

Month of Calving.	District.									
	Metropolitan (*a*)		South-West (*b*)		South Coastal (*c*)		Great Southern (*d*)		All Districts.	
	No. of Lactations.	Average Production.	No. of Lactations.	Average Production.	No. of Lactations.	Average Production.	No. of Lactations.	Average Production.	No. of Lactations.	Average Production.
January	118	291·1	58	282·7	27	274·5	53	299·6	256	288·6
February .	131	278·3	86	291·0	30	295·6	78	307·2	325	287·3
March ..	197	299·1	189	295·2	52	302·1	121	277·9	559	293·5
April	197	307·8	286	302·2	54	312·8	157	313·8	694	307·0
May ...	221	316·7	422	308·1	69	301·7	208	308·9	920	309·8
June	200	308·0	390	299·7	97	327·0	188	307·3	875	306·2
July	229	302·9	365	283·5	85	290·2	170	322·0	849	297·1
August .	299	295·4	411	289·3	91	301·7	213	317·6	1,014	298·2
September .	286	310·7	296	310·2	90	305·4	170	298·7	842	307·6
October	262	306·4	182	287·2	78	295·9	104	303·2	626	299·0
November	161	288 1	120	264·9	59	324·3	73	292·8	413	287·3
December .	198	289·7	64	245·8	39	273 1	61	301·5	362	282·2

TABLE 2.

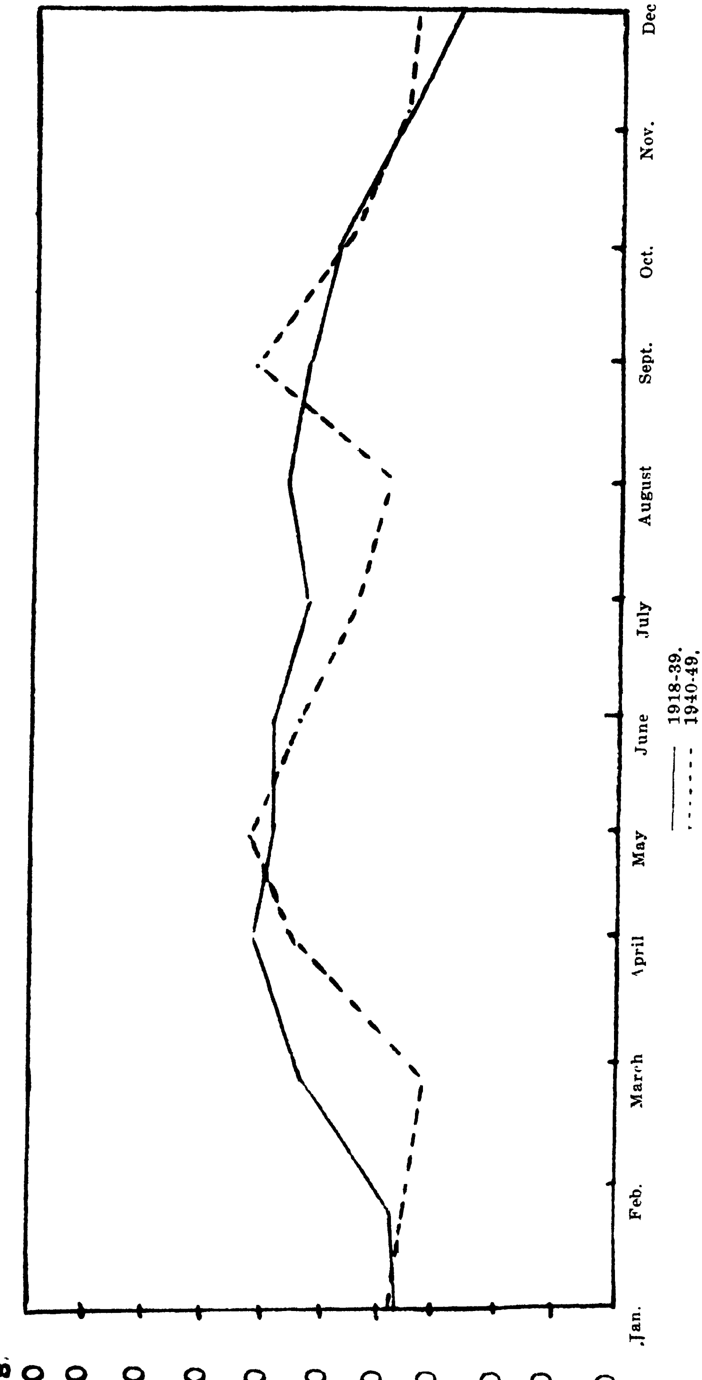
AVERAGE PRODUCTION ACCORDING TO MONTH OF CALVING.

1918–39 *compared to* 1940–49.

Month of Calving.	1918–39.		1940–49.	
	No. of Lactations.	Average Production.	No. of Lactations.	Average Production.
January ...	138	287.9	118	289.4
February	165	288.8	160	285.8
March	279	305.9	280	281.1
April	322	311.2	372	303.3
May .	448	308.1	472	311.5
June .	403	308.2	472	304.6
July	380	303.0	469	292.4
August .	502	306.6	512	289.8
September ...	432	303.9	410	311.4
October . ..	311	299.5	315	298.6
November	208	284.9	205	289.7
December	159	276.2	203	286.8
Average	3,747	302.1	3,988	297.7

Production in the two periods 1918-39 and 1940-49 is compared in Table 2 and Graph No. 2. It is apparent that there has been no change in production according to month of calving between the two periods. The same appears to hold when the sub-periods are further divided to give the four sub-periods mentioned previously. Unfortunately the number of tested lactations in the period 1918-29 is too small to permit conclusions being reached regarding the trend of production according to month of calving for this period. It will also be observed that total production has not materially altered although it must be emphasised that this refers to production of cows tested and may not reflect the position in the industry as a whole.

GROUP No. 2.—PRODUCTION ACCORDING TO MONTH OF CALVING, 1918-39, COMPARED TO 1940-49.



As mentioned previously Tables 1 and 2 are based on all lactations of 150 days, or longer. This is the standard method adopted to determine the average production of a number of lactations: Those lactations which do not continue for 150 days are eliminated and all lactations which run for 150 days or more are considered, whatever the reason for discontinuance at a later date. While sound enough as a general rule, this is a major cause of the great variation between largest and smallest productions in a single lactation. In Table 3 and Graph No. 3 lactations completing the full 273 day period are compared with the average of all lactations. It will be seen that eliminating all lactations of less than 273 days has not affected the overall trend. By decreasing the variation it has however given a slightly smoother curve to the graph. It will be noticed that in all months the average of 273 day lactations is from 16-25 lb. higher than the average of all lactations, and over the 12 months averages 17.8 lb. higher.

TABLE 3.
273 DAY PRODUCTION COMPARED TO PRODUCTION OF ALL LACTATION.

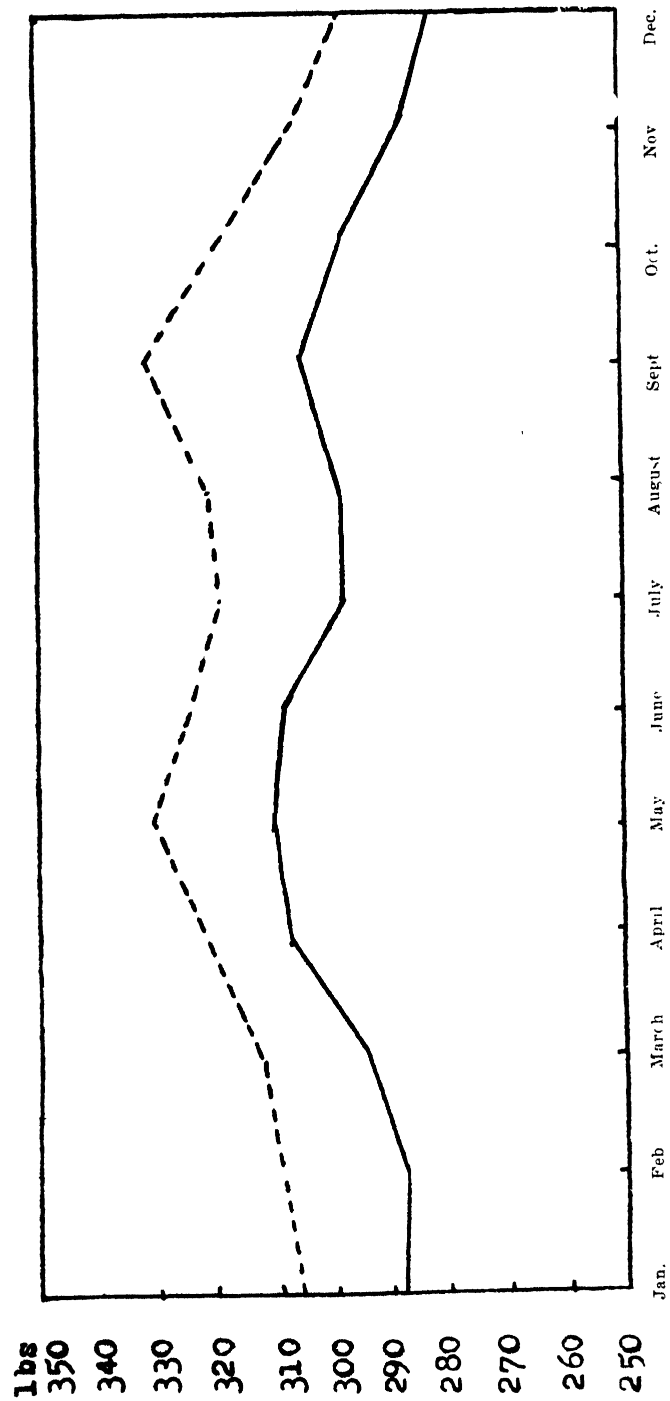
Month of Calving.	273 Day Lactations.		All Lactations.		Percentage of Lactations Completing 273 Days.
	No. of Lactations.	Average Production.	No. of Lactations.	Average Production.	
January	218	306.0	256	288.6	85.2
February	262	309.2	325	287.3	80.6
March	457	312.5	559	293.5	81.7
April	586	323.7	694	307.0	82.9
May	738	331.7	920	309.8	80.2
June	685	323.4	875	306.2	78.3
July	636	319.6	849	297.1	74.9
August	789	322.6	1,014	298.2	77.8
September	682	332.8	842	307.6	81.0
October	499	319.4	626	299.0	79.7
November	333	305.7	413	287.3	80.6
December	255	300.3	362	282.2	70.4
Total	6,140	317.6	7,735	299.8	79.4

A further column has been added to Table 3 showing the percentage of all lactations which complete a 273 day period. There is no trend according to month of freshening the highest being 85 per cent. in January and the lowest 70 per cent. in December, average 79.4 per cent.

It will be further seen from Graph No. 3 that there are two peaks in total production according to month of freshening. The significance and importance of this cannot be determined until further testing has been carried out in years to come. It cannot be explained as caused by a May peak in one district and a September peak in another district as will be seen by study of Graph No. 1 which shows the production of individual districts. Until further lactation records are available for study, all that can be said is that cows which freshen in the intermediate months of the year are likely to produce more than cows which freshen at either end of the year, under the average conditions existing in pure bred herds in this State.

The spread of calvings throughout the year can be readily seen by study of Table 1. It will be observed that there is a definite tendency towards freshening cows in the intermediate months of the year although the spread is

GRAPH No. 3.—COMPARISON ALL LACTATIONS AND 273 DAY LACTATIONS.



——— All lactations. - - - - - 273 day lactations

much greater than is found in grade herds and the peak is several months later. In grade herds it was found that 78 per cent. of all lactations commence in the five monthly period March-July; this investigation showed that only 50 per cent. of pure bred cows under test are freshened in this period and that 67 per cent. are freshened in the six months from April to September. Study of Table 2 will show that the spread of calvings throughout the year is materially the same in the period 1940-49 as in the earlier period 1918-39. Thus it is seen that the spread of calvings throughout the year is not only very similar from one district to another but is also constant throughout the years.

SUMMARY.

Production according to month of calving was studied for all cows tested under the Official Australian Pure Bred Dairy Herd Recording Scheme over a period of 32 years, the State being divided into four districts. It was found that production of cows freshened in January, February, November and December tended to be lower than that of cows freshened in the intermediate months of the year. The trend in the early years of testing was found to be similar to that in the last decade. Differences in production according to month of calving were slight when compared to those found in grade herds in a previous study.

Production from lactations completing 273 days is compared to production from all lactations.

Results are discussed and the conclusion reached that, within the limits set by breeding, feed is the limiting factor to production of cows in the South West of this State.

FERTILISER TRIALS ON ANNUAL PASTURE.

WOKALUP RESEARCH STATION.

M. CULLITY, SUPERINTENDENT OF DAIRYING. H. G. ELLIOTT AGROSTOLOGIST.

INTRODUCTION.

THE Australian Dairy Produce Board Pasture Improvement Committee (W.A.) is comprised of two representatives of dairy produce manufactures, three dairy farmers and the Superintendent of Dairying.

It derives its funds from the Australian Dairy Produce Board and the Rural Credits Branch of the Commonwealth Bank.

Although the Department of Agriculture does not contribute directly to the Committee's funds, expenditure is incurred in carrying out the various projects on its behalf.

The grant from the Rural Credits Branch of the Commonwealth Bank is on a £1 for £1 basis with the expenditure by the Department with a maximum of £250 per annum.

The Committee has approved of a number of pasture demonstrations and experiments in recent years and has also sponsored various competitions with pasture, fodder conservation and farm management. Its endeavours are to create a "pasture conscience" amongst farmers and to help in obtaining advances in pasture establishment and management.

The following reports are on projects conducted for the Committee at the Wokalup Research Station.

Similar trials are being conducted at Denmark, Manjimup, Mt. Barker, Margaret River and Byford on winter pastures, while other experiments have been completed on irrigated pastures at Harvey and Waroona.

PART I.—Rate and Time of Application of Superphosphate to Winter Type Pasture.

SUMMARY.

This experiment was carried out during the five seasons 1943-47.

Superphosphate was applied as one dressing in the autumn at rates equivalent to from 0 to 6 cwts. of 23 per cent. phosphoric acid super. per acre while up to four cwt. per acre were also used in two dressings, one in autumn and another in spring.

Data is presented relating to—

(a) The yields per acre as tons green, air dried, and dried at 80° C.

(b) Botanical analyses giving clover percentages and yields.

(c) Chemical analyses for nitrogen phosphorus and calcium for five years and potassium for three years.

(d) Rainfall data for growing periods during the five years.

The results show that an application of two cwts. of superphosphate per acre in the autumn was the most economic. Applications in excess of this amount did not give any significant increase. No advantage followed the application of part of the fertiliser in the autumn, and part in the spring.

The subterranean clover and grass balance were maintained throughout the trial under all superphosphate treatments.

OBJECTIVE.

The object of the experiment was to obtain information regarding the response of mixed subterranean clover pasture to varying rates of application of superphosphate and to ascertain whether it was better to apply fertiliser in the autumn or portion in the autumn and the remainder in the spring.

It was planned to obtain this information by determining :—

(a) The yields of green and dry material, phosphorus, nitrogen, potassium and clover produced per acre resulting from autumn applications of 23 per cent. phosphoric acid superphosphate at rates varying from 0 to 6 cwts. per acre.

(b) The yields of green and dry material, phosphorus, nitrogen, potassium and calcium and clover produced per acre resulting from applications of 23 per cent. phosphoric acid superphosphate when applied in the autumn and spring.

(c) The effect of autumn dressings of 1, 2, 3 and 4 cwts. of 23 per cent. phosphoric acid super. per acre applied in the autumn compared with similar quantities applied in two dressings, one in autumn and one in spring.

RAINFALL.

Table I. (attached) gives the rainfall figures for Harvey for the growing period for the five years 1943-47, together with the average rainfall in months for the five years and the average month's fall over a period of 45 years.

It will be seen from this Table that the amount of rain which fell during the growing period varied from 28 inches to 53.36 inches. The two years, 1945 and 1947, were above average and the results of the yields obtained during those years varied somewhat from the other three years.

In 1944 and 1946 very little rain fell after the spring application of super. and it is debatable if there were sufficient to fully utilise the fertiliser or even to wash it completely off the leaves.

TABLE 1.

MONTHLY RAINFALL FIGURES FOR YEARS 1943–47.

Falls in Inches as Registered at Harvey (3 miles North of Wokalup).

Month.	Years.					Average Fall in Month for 5 Years.	Average Fall in Month for 45 Years.
	1943.	1944.	1945.	1946.	1947.		
April	1.93	.91	.43	.93	3.09	1.46	1.78
May	3.64	5.98	11.81	8.39	12.12	8.39	5.63
June	5.80	4.98	18.43	7.88	13.78	10.17	8.00
July	6.04	8.22	6.44	15.80	5.24	8.35	7.97
August	4.66	4.34	9.99	4.97	3.62	5.52	6.07
September	6.08	1.49	4.29	1.33	3.41	3.32	4.41
October	.35	.82	.83	.15	3.52	1.13	2.85
November	.06	1.28	1.14	.33	.44	.65	1.03
Total for growing period	28.56	28.02	53.36	39.78	45.22	....	...
Average for five years for growing period	.	..		..	...	..	36.99
Annual Average for growing period		..	.	..	.		37.74
Total for year	34.32	30.59	55.71	44.67	46.82		..
Annual Average 45 years	40.00			...	...	.	40.00

EXPERIMENTAL.

(1) *Materials and Methods*—

(a) Area and botanical cover.

An area of three acres was selected carrying subterranean clover as the dominant species, and evenly over the area. In addition the following grass species were present: festuca, bromus, lolium, and some cynodon-dactylon. Weeds were not present in serious proportion although a few plants of cape weed and flat weed were present.

It is believed that at least 25 cwts. per acre of superphosphate had been applied to the paddock during the 15 years prior to the commencement of the experiment. In the years immediately prior to this trial, the paddock was used as pasture and for two crops of flax. Earlier occasional oat crops broke the sequence of use as pasture.

(b) Soil.

The soil is slightly podsolised with talus material as parent rock. The profile was—

Inches.	
0– 4	Yellowish brown loam with organic matter. Structure—large crumb.
4–22	Yellow clay loam plus small decayed gravel particles (few).
22–33	Brown and yellow mot, clay plus partially decayed pieces of grave, gneiss, granite, also quartz lumps. Structure—nutty to massive.
36–45 and on	Greyish brown, yellow brown and white (dull shades) mottled heavy clay and plus pieces of gneiss and other rocks. Structure—massive

2. *Design and Treatments.*

The twelve treatments shown in Table 2 were replicated six times in a randomised block system.

TABLE 2.

Treatments.

Series.	Rates of Superphosphate per acre.		
	Autumn cwt.	Spring cwt.	Total cwt.
A ..	0	0	0
B ..	1	0	1
C .	2	0	2
D . .	3	0	3
E	4	0	4
F .	5	0	5
G	6	0	6
H .	0	1	1
J . . .	1	1	2
K	1	2	3
L	2	1	3
M	2	2	4

3. *Botanical Analysis.*

A botanical analysis of the plots was carried out in May, 1943, prior to the first application of fertiliser. Five counts of subterranean clover plant on four square link areas were made on each plot. The number of plants per square link is shown in Table 3.

TABLE 3.

Number of Subterranean clover plants per square link.

Series.	Treatments cwts. super. per. acre.		Subterranean clover plants per square link.	
	Autumn.	Spring.	Total.	Mean.
A	0	0	224.0	37.3
B	1	0	208.4	34.7
C	2	0	230.7	38.4
D .	3	0	272.6	45.4
E	4	0	253.2	42.2
F	5	0	226.8	37.8
G . . .	6	0	269.4	44.9
H	0	1	238.8	39.8
J	1	1	236.4	39.4
K	1	2	245.0	40.8
L	2	1	250.9	41.8
M	2	2	252.6	42.1
		Mean	242.4	40.4
		Range ...	34.7 to 45.5 link.	plants per sq.

At the time the above analyses were made the germination of subterranean clover plants was still taking place and it was anticipated that the final number of clover plants per square link would be greater.

Although grass species such as silver, brome, rye and couch were present in appreciable amounts, weeds on the area were not serious.

The population of clover plants on the area was considered good and as uniform as could be expected.

4. *Superphosphate.*

At the commencement of the experiment in 1943, 23 per cent. phosphoric acid superphosphate was used, the origin of the rock being Nauru. Since 1943 the rock came from North Africa and the phosphoric acid content varied from 18 to 20 per cent. but each year the amount applied was increased to give the equivalent to 23 per cent. phosphoric acid.

The dates of application were :—

	Autumn.	Spring.
1943	29th March	6th September
1944	17th April	23rd August
1945	11th April	27th August
1946	8th April	21st August
1947	29th April	14th August

5. *Grazing, Mowing and Sampling.*

No grazing of the area was carried out during the growing period. The only grazing given was during the period when the pasture was dry.

The plots were harvested by means of a mower at the hay cutting stage, the dates being as follows :—

10th November, 1943, 2nd November, 1944 ; 6th November, 1945 ; 6th November 1946 ; 24th November, 1947.

The gross weight of each plot was recorded and a sample weighing four pounds taken.

After air drying all samples reprsenting each separate treatment were bulked, and two further samples taken therefrom, being composite samples representing all plots in each treatment. One of these was used for botanical segregation to determine the proportions of clover, and the other subjected to chemical analysis.

RESULTS.

1. *Yields.*

Table 4 summarises the complete results for all treatments and gives the mean averages for five years of yields of green, dry, and air dried material per acre, the percentage and yield of clover and grass and the nitrogen, phosphorous, calcium and potassium percentages and weight in pounds per acre.

Comments on the yearly average yield of air dried material obtained in cwts. per acre from the various treatments are as follows :—

(a) The yield from the application of 1 cwt. per acre was 9.8 cwts. more than from the plots receiving no superphosphate.

(b) Two cwts. per acre of superphosphate gave 5.2 cwts. more than the one cwt. applications.

(c) Two cwts. per acre of superphosphate gave 15 cwts. more than the on fertiliser plots. This is equal to 7.5 cwts. for each one cwt. of superphosphate used.

(d) Applications of three, four, five and six cwts. of superphosphate gave no significant increase in yields.

(e) There was an increase of three cwts. from the six cwts. compared to the two cwts. superphosphate treatments, but owing to the seasonal and plot variations this increase cannot be considered significant.

(f) The yields from the two cwt. superphosphate treatments were slightly superior over the period of the experiment than any treatment where second applications of superphosphate were made in the spring, following one or two cwts. in autumn. However, plot and seasonal variations make this higher yield without significance. Conversely there is significance in the regular failure of spring applications to stimulate additional growth over that obtained from an application of two cwts. in the autumn (see Table 4 and graph 1).

TABLE 4.
YIELDS OF HERBAGE.

Symbols.	Treatments. Super. Applns. Applied. Autumn.	Spring.	Yields. Green.	Air Dry.	Dried 80°C.	Moisture lost from Air dry.
	Cwt./acre.	Cwt./acre.	Tons/acre.	Tons/acre.	Tons/acre.	%
A ..	0	0	5.61	2.09	1.84	11.5
B	1	0	8.18	2.58	2.25	13.0
C ...	2	0	8.52	2.84	2.48	12.0
D .	3	0	8.91	2.83	2.48	12.0
E ...	4	0	8.90	2.89	2.50	13.0
F	5	0	9.03	2.84	2.49	12.0
G	6	0	9.38	3.00	2.63	12.1
H ..	0	1	7.75	2.43	2.12	12.5
J ...	1	1	8.26	2.63	2.31	12.0
K ..	1	2	8.23	2.72	2.38	12.5
L .	2	1	8.32	2.79	2.45	11.9
M ..	2	2	8.84	2.72	2.38	12.5
S/E of Treatment mean Tons/acre			.	.081		....
Least sign. diff. Tons/acre at 5%				.23	.	....
,, ,, ,, 1%			.	.31		.

2. *Botanical Composition.*

From the samples cut from the individual plots, composite samples for each treatment were made each year. These were segregated in order to determine the proportion of subterranean clover present, and the details are given in Table 5. These show that the yield of clover was increased by every application of superphosphate compared with the plots where none was used. The gross weight from the latter treatment over the five years was 96.2 cwts. of air dried material compared with 161.7 and 152.1 cwts. respectively from the five cwt. and the six cwt. treatments. These represented the highest yield for the treatment.

TABLE 5.
BOTANICAL COMPOSITION.

Symbols.	Treatments. Super. Applns. Applied. Autumn.	Spring.	Composition. Clover.	Grass.	Clover.	Air Dry Grass.
	Cwt./acre.	Cwt./acre.	%	Tons/acre.	Tons/acre.	Tons/acre.
A ...	0	0	46.0	54.0	.96	1.13
B ...	1	0	43.3	56.7	1.11	1.47
C	2	0	43.9	56.1	1.24	1.60
D	3	0	48.0	52.0	1.36	1.47
E ..	4	0	43.9	56.1	1.26	1.63
F ...	5	0	57.0	43.0	1.61	1.23
G	6	0	50.6	49.4	1.52	1.48
H ...	0	1	49.8	50.2	1.21	1.22
J ...	1	1	50.4	49.6	1.32	1.31
K ..	1	2	54.0	46.0	1.46	1.26
L ...	2	1	47.7	52.3	1.33	1.46
M ..	2	2	48.6	51.4	1.32	1.40

3. *Chemical Composition Table* 6.

A division of the composite sample for each treatment for each year was made and a sub-sample was forwarded to the Government Chemical Laboratories for determination of nitrogen, phosphorus and calcium.

For the years 1944–5 to 1945–6 and 1946–7, analyses for the potassium content were carried out also.

(a) Phosphorus.

The average percentage of phosphorus on a dry weight basis and the total weight which is equivalent to the amount withdrawn from the soil is shown in Table 6. It will be noted that there is a progressive increase in both the percentage and the total withdrawal of phosphorus as the rate of application of superphosphate increased.

There was an increase in the percentage of phosphorus where a second application of superphosphate was given in spring but there was no appreciable increase in the total amount contained in the herbage.

(b) Nitrogen.

There was no increase in the percentage of nitrogen in the one and two cwt. treatments compared to no fertiliser, but the proportion from the five and six cwt. treatments was slightly higher.

The greater bulk from the two cwt. plots caused the total quantity of nitrogen to be higher than in the no fertiliser treatment.

The total quantity of nitrogen from the five and six cwt. treatments was higher than from the two cwt. plots.

No improvement in the total yield of nitrogen can be seen where autumn and spring applications were given.

(c) Calcium.

There appeared to be an increase in the proportion of calcium and the total taken up from the soil were five and six cwts. were applied. Some small increase also resulted from spring applications.

(d) Potassium.

The analyses for potassium were carried out in three years of the experiment only. There is no indication of any variation in the percentage nor the total uptake of this element.

TABLE 6.

CHEMICAL COMPOSITION OF ASH OF HERBAGE.

Symbols.	Treatments. Super Applns. Applied.		Analysis on Dry Basis.							
	Autumn.	Spring.	N.	P.	Ca.	K.	N.	P.	Ca.	K.
			%	%	%	%	Lbs./ acre.	Lbs./ acre.	Lbs./ acre.	Lbs./ acre.
A ..	0	0	2.03	.134	.86	1.38	83.36	5.52	35.45	42.9
B ..	1	0	1.94	.166	.85	1.32	97.65	8.21	42.64	51.9
C ..	2	0	1.88	.198	.78	1.19	104.2	11.04	43.61	50.1
D ...	3	0	2.13	.222	.89	1.21	117.92	12.3	49.29	50.5
E ..	4	0	1.92	.241	.88	1.30	107.9	13.53	49.02	54.7
F ..	5	0	2.23	.244	.95	.99	124.86	13.61	53.06	38.7
G ..	6	0	2.15	.263	.95	1.08	126.3	15.54	56.29	47.8
H	0	1	2.02	.187	.90	1.20	96.78	8.95	43.15	45.9
J .	1	1	2.03	.218	.90	1.16	104.42	11.26	46.56	45.4
K	1	2	1.98	.251	.94	1.42	105.84	13.45	51.46	58.9
L	2	1	2.02	.239	.95	1.30	111.86	13.16	50.82	53.3
M .	2	2	2.26	.257	1.00	1.30	121.06	13.74	53.22	53.9

DISCUSSION.

The application of superphosphate to pastures in Western Australia is a universal practice. The quantity applied varies according to district ; the rates in the heavy rainfall districts (on winter pastures) in which dairying is a major activity range from about ¾ to 2 cwt. per acre. Statistical reports indicate that the average application is approximately 120 lbs per acre.

Earlier unreported trials supported by observation suggested that the average application was lower than the optimum. Opinions formed on these trials were the basis for advising farmers that higher applications would be economical and generally two cwts. per acre are recommended. This was frequently translated to the farmer's practical measure of one bag (187 lbs) per acre. There was no reliable data to indicate whether higher applications would be profitable. A few farmers in the development stage of their farms appeared to gain an advantage from using higher quantities but in succeeding years the response measured by observation of pastures, from carrying capacity, or from output of produce was less obvious. In other words the evidence for and against higher rates was conflicting.

The data procured in the experiment has clarified this position, as it shows that the autumn application of two cwts. of superphosphate gave the most economical yields. The greatest increase per cwt. was from the one and two cwt. applications.

While some of the results from rates from three to six cwt. suggested a slightly higher yield, the figures are not considered significant. Even if these were acceptable, the amount of increase would not repay for the cost of the additional applications.

An improvement in the proportion of clover in the pasture was recorded as rates were increased up to three cwts. and this was accompanied by an increase in the total nitrogen. This is important as it confirms the importance of increasing the level of application to two cwts. not only in order to get greater yields but herbage of higher nutritive quality, particularly in respect to its protein.

The higher applications did not result in any advantage, either in respect to bulk or the proportion of clover over the two cwt. treatments, and therefore, it may be concluded that from the aspect of yield and maintenance of the clover the optimum application in the conditions of this trial was two cwt. per acre.

There are interesting possibilities however, in the higher nitrogen, phosphorus and calcium uptake recorded for the higher dressings.

It may be that there is an advantage in using higher applications because of the better protein and mineral contents of the pastures. It is probable, however, that the supply of mineral licks would be more economical in supplying animal requirements. In any case with a prolonged period of annual topdressing with superphosphate the mineral composition of our pastures will probably rise. There is some evidence that this has occurred.

Some farmers still follow the practice of with-holding some of the superphosphate purchased in autumn for application in the spring usually on paddocks intended for hay. Others refrain from ordering their full requirements in the autumn and get the balance for spring topdressing. This practice has lessened in recent years but considerable interest is still maintained as to the economics of the practice. The present trial has shown that there is no advantage in dividing applications up to four cwt. instead of applying two cwt. in the autumn. This result was obtained with yields, botanical and chemical composition, with the exception that there appeared to be an improvement in the calcium with spring dressings. When the additional expense and wastage of time involved in giving the second dressing is considered it will be realised that the second dressing is unprofitable.

CONCLUSION.

The results show that under conditions of this experiment the optimum rate of application of superphosphate of winter pastures of subterranean clover and mixed grass is two cwts. of superphosphate per acre. The gain by applying two instead of one was appreciable. There was no advantage from applying the fertiliser in both autumn and spring.

PART II.—An investigation to study the residual effect of superphosphate in years subsequent to application on subterranean clover-grass pasture.

SUMMARY.

An experiment to obtain information regarding the residual effect of superphosphate applied to subterranean clover-grass, annual type pasture was conducted during the period 1943–47. Details of yields from plots to which no superphosphate had been applied over one, two, three, four and five years compared to which the equivalent of two cwt. of 23 per cent. phosphoric acid superphosphate had been applied annually are presented.

It was concluded that following several annual applications of superphosphate to pasture in adequate amounts, the omission of a dressing in one year caused only a slight decline in yield. However, in view of the varying soil types present in the dairying district and the fact that the phosphate status of many pasture soils has not as yet been sufficiently built up, the omission of fertiliser in any year is not recommended.

Replications of each treatment were five in number, and the design of the experiment was of the randomised block type.

Climate, soil, pastures and time of cutting were similar to those for the experiment described in Part 1 of this report.

Detailed results are presented of the following :—

(*a*) *Green, air dry and dried at 80° C. yields of herbage.*

(*b*) *Botanical analyses.*

(*c*) *Chemical analyses showing the percentages and the rates of withdrawal in pounds per acre of nitrogen, phosphorus and calcium for five years and potassium for three years.*

OBJECTIVE.

The experiment was designed to measure the residual effect of superphosphate over one, two, three, four and five years by determining the comparative yields both green and dry weights, together with analyses for phosphorus, nitrogen, potassium and calcium from areas to which no superphosphate had been applied for varying periods up to five years, following one or more annual applications at the rate of two cwt. per acre, by—

(a) determining the yields of green and dry material, clover, phosphorus, nitrogen, potassium and calcium per acre from Autumn applications of superphosphate at the rate of two cwt. per acre over one, two, three, four and five years.

(b) Comparing the residual effect on plots to which no superphosphate had been applied for one, two, three, four and five years.

EXPERIMENTAL.

1. *Rainfall—Location, etc.*

As the trial was conducted in the same paddocks as that reported in Part 1 the information contained therein referring to rainfall, soil, prior history, botanical composition, fertiliser, grazing, cutting and sampling may be taken as referring also to this report.

2. *Design and treatments.*

Five series of treatments were included plus a control series receiving two cwt. of superphosphate each year. Each was replicated five times in a randomised block design. Details of the treatments are given in table 7.

TABLE 7.

SUPER PER ACRE

Treatment.	1943.	1944.	1945.	1946.	1947.
	cwt.	cwt.	cwt.	cwt.	cwt.
A	0	0	0	0	0
B ..	2	0	0	0	0
C	2	2	0	0	0
D	2	2	2	0	0
E	2	2	2	2	0
F	2	2	2	2	2

RESULTS.

1. *Yields.*

Details of the amount of herbage, the botanical composition, and chemical analyses, together with the gross withdrawal of the main elements are presented in tables 8, 9 and 10. All figures relate to the average for the five year period

TABLE 8.
YIELDS OF HERBAGE.

Symbols.	Treatments.		Yields Yearly.			Moisture lost.
	Years with Super. 2 cwt. per year.	Years without Super.	Green.	Air Dry.	Dried 80°C.	
			Tons/acre.	Tons/acre.	Tons/acre.	%
A ...	Before 1943	1943–47	4.98	2.00	1.78	11.0
B ...	1943	1944–47	5.7	2.05	1.82	11.0
C ..	1943–44	1945–47	6.62	2.23	1.98	11.0
D	1943–45	1946–47	6.69	2.29	2.07	9.5
E	1943–46	1947	7.35	2.56	2.26	12.0
F	1943–47	Nil	7.51	2.43	2.14	12.0
S/E of Treatment mean Tons/acre			...	.101	.	....
Least Sign. Diff. Tons/acre at 5%			....	.301	....	....
" " " 1%			....	.41	....	....

TABLE 9.
COMPOSITION OF HERBAGE.

Symbols.	Treatments.		Composition.			
	Years with Super. 2 cwt. per year.	Years without Super.	Clover.	Grass.	Clover.	Air Dry Grass.
			%	%	Cwt./acre.	Cwt./acre.
A ..	Before 1943	1943–47	41.0	59	16.4	23.6
B	1943	1944–47	42.3	57.7	17.3	23.7
C ..	1943–44	1945–47	45.4	54.6	20.2	24.4
D ..	1943–45	1946–47	48.0	52.0	22.0	23.8
E	1943–46	1947	44.5	55.5	22.8	28.4
F	1943–47	Nil	49.2	50.8	23.9	24.7

TABLE 10.
COMPOSITION OF ASH OF HERBAGE.

Symbols.	Treatments.		Analysis on Dry Basis.							
	Years with Super. 2 cwt. per year.	Years without Super.	N.	P.	Ca.	K.	N.	P.	Ca.	K.
			%	%	%	%	Lbs./ Acre.	Lbs./ Acre.	Lbs./ Acre.	Lbs./ Acre.
A	Before 1943	1943–47	1.93	.129	.82	1.25	76.33	5.12	32.38	37.9
B	1943	1944–47	2.18	.168	.88	1.10	88.16	6.78	35.52	34.0
C	1943–44	1945–47	2.10	.181	.84	1.25	93.75	8.05	37.21	41.9
D	1943–45	1946–47	2.11	.194	.77	1.14	97.2	8.94	35.42	40.3
E	1943–46	1947	2.12	.186	.88	1.16	107.24	9.30	44.52	49.2
F	1943–47	Nil	2.24	.210	.94	1.08	106.56	10.00	45.11	41.9

with the exception of potassium for which figures for the three years 1944-45 and 1947 only were obtained. In table 10 the weights for the various elements refer to the whole of the five year period. The yields of the treatments B, C, D, E and F compared with that from treatment A is given below in Table 11.

TABLE 11.

Treatment.	Years receiving Super.	Yield.	Increase over A.
		tons cwt.	cwt.
A ...	..	2 0	...
B ...	1943	2 1	1
C ...	1943–4	2 4.6	4.6
D ...	1943–4–5	2 5.4	5.4
E ...	1943–4–5–6	2 11.2	11.2
F ...	1943–4–5–6–7	2 8.6	8.6

An examination of the yields for each of the five years shows that the end of the 1943 Treatment (A) without super. was slightly but not significantly inferior to the other treatments.

In the next year, 1944 when treatment (A) had then been two years without superphosphate topdressing, its yields were significantly inferior to the others. On the other hand, the yield of Treatment (B) in this year, now one year without superphosphate, had not fallen significantly, but in the third season, notably inferior yields were recorded for both Treatments (A) and (B), for which superphosphate topdressing had now ceased for three and two years respectively. The yields from Treatment (C) now one year without superphosphate topdressing had not yet fallen greatly.

For the fourth year yields from Treatments (A) and (B) continued to fall while (C) now two years without superphosphate fell appreciably.

Graph 2 illustrates the tendency for yields to progressively decline with the passage of years with no superphosphate applications.

2. *Botanical Analyses.*

The percentage and yields of subterranean clover per acre are given in table 9. It will be noted that the percentage of clover decreased when superphosphate was not applied in one year. The depression on the proportion of clover became more acute when fertiliser was not used in more than two years.

3. *Chemical Analyses.*

The result of the chemical analyses of samples from each treatment together with the amounts of nitrogen, phosphorus, potassium and calcium taken up by the plants are given in table 10.

A drop in the phosphorus content of the pasture occurred when only one year's application of superphosphate was missed. The decline was accentuated with subsequent omission of topdressing. Where fertiliser was applied annually the percentage of phosphorus was .21 but on the plots which received no superphosphate for five years it fell to .129. The total uptake in the former case was 10 lb. and in the latter 5.12 lb. only. The rates of withdrawal of phosphorus showed a regular decrease according to the number of years in which the superphosphate topdressing had been omitted. It is of interest to record that the withdrawal of 10 lb. of phosphorus per acre is equivalent to the amount of this element in 99.5 lb. of 23 per cent. superphosphate.

The amount of nitrogen on the herbage also showed a decline when no fertiliser was applied for two years, and became more pronounced with the omission of topdressing in succeeding years.

The percentage of nitrogen however, did not show any significant variation except in the plots which received no superphosphate throughout the period of the experiment. The fall in the total weight of nitrogen was, therefore, related to bulk. It will be noted from table 9 that the percentage of clover decreased with the passage of years with no fertiliser. Whether this fact is related to the fall in the total nitrogen uptake cannot be demonstrated from the data although on general grounds it could be assumed that there was such a relationship.

There is no significant variation in the percentage of calcium although there is a fall in the total uptake as topdressing was omitted over a period of years. This again, in view of the maintenance of an even percentage can only be related to the decline in bulk. Details for potassium are also included. As indicated above analyses were made for this element for three years only. There was no significant variation.

DISCUSSION AND CONCLUSIONS.

During the war years many farmers enquired whether the reduced quantities of superphosphate which they could purchase would be better applied evenly over all their pastures annually, or at usual rates over a different portion of their property each year. While there was no experimental data available on which to base a conclusion, experience seemed to indicate that regular applications over all the pasture was preferable. There were many cases where after many years of annual topdressing farmers adopted the practice of topdressing part of their pasture only each year but observation has indicated that the practice was not successful. Results however were obscured somewhat by the general decline in pasture growth, following some years of reduced topdressing rates. This trial was designed to obtain some concrete data on the problem and the results tend to support the contention that regular annual applications are advisable.

The slight fall in yields following one year's omission of fertilizer should be considered, having in mind that annual topdressing of the experimental area had been the practice for many years. Had the paddock received no or only light applications over a number of years prior, the differences from the various treatments may have been more pronounced. However, there is support for annual topdressing although the effect of one year's omission in this experiment was not great. It would be an interesting subject for another trial to determine the effect of alternating topdressing and omissions.

In conditions similar to those at Wokalup it appears that best results will follow an annual application of superphosphate while the experiment described in Part 1 indicates that two cwt. is the optimum amount. Should circumstances recur, limiting the quantity of superphosphate available it can now be recommended with some experimental support that a reduction of the rate of application would be preferable to the omission of any portion of the pasture areas from the topdressing programme.

ACKNOWLEDGMENTS.

A number of officers of the Dairy and Irrigation Branches assisted in various ways with these experiments and grateful acknowledgment is made of their help.

STOCK FOODS.

Additional Stock Foods which have been registered at the Department of Agriculture under the Feeding Stuffs Act, 1928-48, for year 1949.

Stock Food.	Reg. No.	Brand.	By whom Registered.	Materials from which Made.	Registered Analysis.							
					Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chloride.	Phos. Acid (P_2O_5).	Lime.	Other.	
					% (Min.)	% (Max.)	% (Max.)	% (Max.)	%	% (Max.) Ca	%	%
A.—SIMPLE FOODS. 1.—*Meat Meals.*												
Meat Meal ..	136	BROOME ..	Broome Freezing and Chilling Works	Meat and bone	60·0	10·0	10·0		11·0	.	....	.
Do. . . .	143	MIDLAND ..	State Abattoirs (Midland Junction)	Meat Offal and waste	51·0	19·0	2·0		. .	....	...	.
2.—*Meat and Bone Meals.*												
Meat and Bone Meal	132	ABERDEEN	W. R. and N. N. Clarke	Meat and bone .	48·0	15·0	2·0	.	. .	....	.	
Do. do.	133	S.M.P.	do. do. do.	do.	50·0	13·0	2·0	.		. ..	.	
Fortified Protein Meal	137	IMPERIAL	W. Angliss & Co. (Aust.), Ltd.	Meat, bone, livers and animal offal	50·0	12·0	2·0		.		.	.
5.—*Milk Foods.*												
Dried Buttermilk	138	MAFFCO	W. R. and N. N. Clarke	Buttermilk dried	30·0	(Min.) 5·0		.	.	...	..	..
8.—*Liver Meals.*												
Liver Meal . .	142	IMPERIAL	W. Angliss & Co. (Aust.), Ltd.	Meat, bone, livers and animal offal	65·0	18·0	.				.	
B.—COMPOUND FOODS. 2.—*Cattle Foods.*												
Cattle Food .	140	EVELYN	Tropical Traders, Ltd.	Linseed meal, salt, limestone, chalk, animal charcoal, molasses, sulphur minerals and medicinal herbs, pollard	5·0	3·0	5·5	13·0	3·7	9·5	Max. Sulphur 3·6	.
4.—*Sheep Foods.*												
Sheep Food	141	do.	do. do.	do. do. do.	5·0	1·0	5·0	13·5	3·7	9·6	3·6	
6.—*Chick Foods.*												
Chicken Meal	134	ROYAL SEAL	J. and W. Bateman Pty., Ltd.	Wheat, pannicum seed, peas, maize, shellgrit	10·0	2·0	4·0	.		.	...	
7.—*Pig Foods.*												
Pig Food	139	EVELYN	Tropical Traders, Ltd.	Pollard, linseed meal, salt, limestone, chalk, sulphur, animal charcoal, minerals and medicinal herbs	5·0	1·0	5·0	9·75	3·5	9·5	4·5	
C.—STOCK LICKS. 2.—*Bone Meals.*									(Min.)	(Min.) CaO		
Bone Meal .	135	WATTLE .	Wattle Fertilizer Co. .	Bones . .	16·0	.		.	22·5	30·0	...	
Sterilised Bone Grit Meal	144	NA ...	W. Thomas & Co (W.A.), Ltd.	do.	20·0	8·0	1·0	0·2	20·0	10·0	.. .	

FURTHER NOTES ON PHOSPHORUS DEFICIENCY IN DAIRY COWS.

(See pp. 169 of this Journal,)

MUCH additional experience has now been obtained in the practical use of concentrated solutions of soluble phosphate prepared by mixing superphosphate with water. These solutions have been used to damp down the food given to milking cows in "test" herds and have quickly restored blood phosphorus levels to normal. Production has been particularly good where this supplement has been given a proper trial.

In quite a few cases, however, it has been found that farmers have been using phosphatic solutions which are far too weak to be of value. It is necessary to stress, therefore, that the superphosphate must be *thoroughly* mixed with the measured volume of water, before being left for the sludge to settle out.

Preparation of Saturated Solutions of Water-soluble Phosphate.

Superphosphate should be added to water at the rate of 5 lb. per gallon. Mix thoroughly with a stick and then pour from bucket to bucket about six times. Where the containers are too large to do this, stir thoroughly from top to bottom using a mixer made like a cream stirrer.

When all the water soluble phosphate has been dissolved further stirring is unnecessary. In practice, however, it may be an advantage to have two or three containers which can be used in rotation. If these are placed in a handy position it is not much bother to give them all a thorough stir several times a day.

On being left to stand, the undissolved material quickly settles to the bottom leaving a clear fluid which can be dipped off as required.

The sludge on the bottom should be thrown on the manure heap before the next batch is prepared.

Testing the Strength of Solutions.

The concentration of prepared phosphate solutions can be tested very simply by using an hydrometer as is used in testing car batteries. These cost about 12s. 6d. each. Solutions giving a reading of 1.100 or better are satisfactory.

With most batches of superphosphate the saturated solutions have a deep amber colour and this colour, when present, can be used as a guide to the concentration. After mixing pour some of the prepared solution into two clear glass pickle bottles. Then add a handful of superphosphate to one bottle, put in a cork, and shake thoroughly for ten minutes. Leave the two bottles side by side until the undissolved material has settled. If the extra superphopshate has increased the colour then the bulk solution is not full strength. The solutions *must* be full strength to give the required results. It should be remembered, however, that some batches of superphosphate do not give brown solutions in which case colour cannot be used as a guide.

Don't be misled by the fear that all this mixing is going to make a lot of work. In practice it does not—remember only half-a-pint of fluid is required per cow per day. But thorough mixing *is* essential for success and cannot be avoided. Perhaps the use of a concrete mixer, or some such device, would expedite matters considerably.

The Addition of Superphosphate to Drinking Water.

This promises to prove a very simple and efficient means of supplying phosphate to stock during the summer months. But it is a method which will quickly break down under careless or "rough and ready" control. It is important that the correct amounts of superphosphate should be added to the water. If too little is used, the stock will not get the desired phosphate. If too much, then the water will be made unpalatable.

As recorded in the foregoing article, it has been shown that, with training, cows will drink water containing 5 lb. of superphosphate per 100 gallons. This is the maximum amount which should be used and this will only be necessary under special conditions. In general practice 2 lb. of superphosphate per 100 gallons should give excellent results. This will not affect the palatability and will each day supply the dairy cow with as much phosphorus as is present in two to three ounces of bonemeal. This represents quite a worthwhile supplement and if available throughout the summer should do much to eliminate any danger of phosphorus deficiency. Where superphosphate is added to large drinking troughs according to the number of cattle using the trough, it is likewise probable that one pound of superphosphate per day for each four cows should be adequate.

It should be remembered that the idea of adding superphosphate to drinking water is a novel one and has yet to be proved in practice. So temper enthusiasm with discretion, make a thorough trial using no more than 2 lb. per 100 gallons. And don't "tip in a bit more, just for luck." The author would appreciate any comments from practical men concerning the results obtained from the use of superphosphate in this manner.

ERRATA.

Journal of Agriculture, Volume XXVI. No. 2. June, 1949.

Page 103, paragraph four line one for "These figures seem to emphasise" substitute "These figures serve to emphasise."

Page 132, paragraph four for "£20, £12, £8 and £6" substitute "£10, £6, £4 and £3" respectively.

Page 164, under "Summary of Data" "Pigs Ratio cows to sows—All Zones" for "171:1" substitute 17.1:1.

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OFFICIAL AUSTRALIAN PURE BRED HERD RECORDING SCHEME

By M. CULLITY, Superintendent of Dairying.

A LIVENING interest in the Recording of pure bred herds has been evident since the end of the war. This is a heartening trend providing the new interest is a sign of a determination to use the data from testing as a means of improving the quality of the herds.

In previous reports reference was made to the tendency to use testing as a means of publicising the merits of a few individual cows and to take advantage of this publicity to sell bulls from mediocre animals.

This is a Herd Recording Scheme and it is most desirable that it should be used for Herd Improvement.

Some of the increase in the number of cows recorded for the past two years is due to a determined effort to ensure that the rules be complied with in respect to submission of all cows and that applications for exemption be strictly in accordance with the conditions.

It is expected that an alteration in procedure will be possible next year whereby all cows irrespective of age and condition will be tested, but fees will not be charged in certain cases to be defined. The performances of these cows will not appear in the published results as they will include only sick cows, etc.

The results for the year are summarised in the following remarks and tables.

Pure Bred Herd Recording.

During the year 672 cows from 47 herds completed test compared with 676 and 46 the previous year.

Owing to deaths, sickness and other reasons 74 cows were withdrawn before before completing 150 days under test and are not included in any of the averages.

The remaining 598 cows averaged 6,022 lb. of milk, Average Test 4.79% and 288.98 lb. of butterfat which is 8.26 lb. of butterfat less than the average for the previous year.

The average production of cows completing test for selected years since 1934 is shown in Table 1.

TABLE 1.
AVERAGE PRODUCTION—PURE BRED HERDS.

Year.	No. of Cows Completing Test.	Average Butterfat per Cow.
		lb.
1934–35	305	320.26
1938–39	375	292.40
1940–41	372	298.38
1942–43	294	321.27
1944–45	344	289.42
1947–48	607	297.24
1948–49	598	288.98

Subterranean Clover and Wimmera Rye Pasture under green timber—Pinjarra.

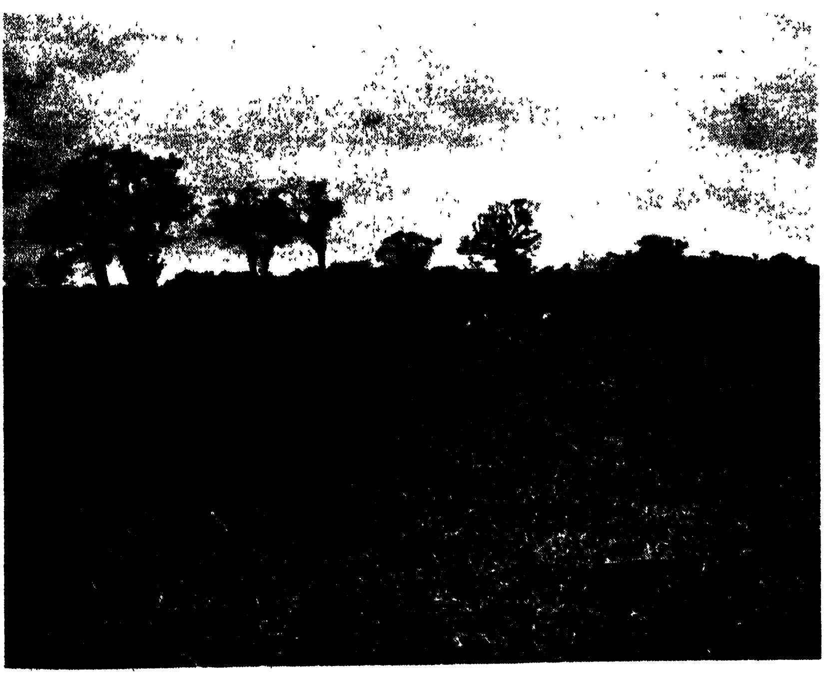
The percentage of cows passing standard for selected years since 1937/38 is given in Table 2. This table reveals that with the exception of the year 1945/46, the percentage of cows passing standard in the year under review is the lowest since 1937/38.

Guernseys show a decrease of 2.3 per cent., Jerseys a decrease of 5.8 per cent. and A.I.S. a decrease of 8.7 per cent. compared with 1947/48. For all breeds only 48.5 per cent. reached standard production compared with 54.0 per cent. in 1947/48.

TABLE 2.

PERCENTAGE OF COWS PASSING STANDARD.

Year.	Australian Illawarra Shorthorn.	Guernsey.	Jersey.	Total.
	%	%	%	%
1937-38	59.1	68.7	35.6	53.1
1939-40	48.0	77.5	64.2	59.2
1944-45	52.5	43.4	72.2	57.3
1945-46	43.1	33.3	52.9	43.8
1947-48	44.4	54.4	63.2	54.0
1948-49	35.7	52.1	57.4	48.5



Irrigated Pasture—Waroona.

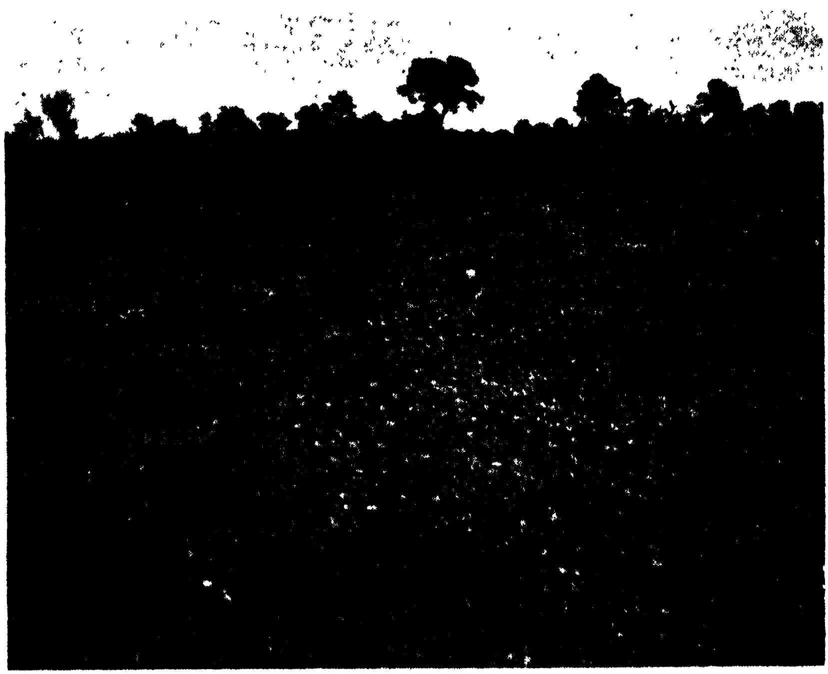
The number of cows passing standard and the proportion in each age group of each breed is shown in Table 3.

A study of this table shows that in the four junior age groups, i.e., senior three to junior two, the precentage reaching standard was 57.8 per cent. while in the three age groups mature to junior four years, the percentage is only 36.2 per cent.

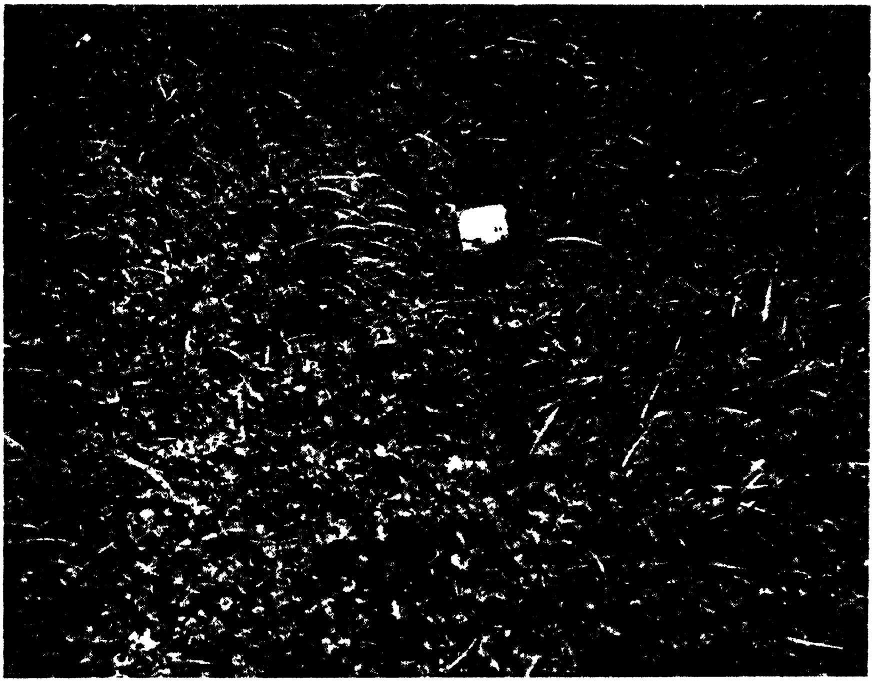
TABLE 3.

COWS PASSING STANDARD.

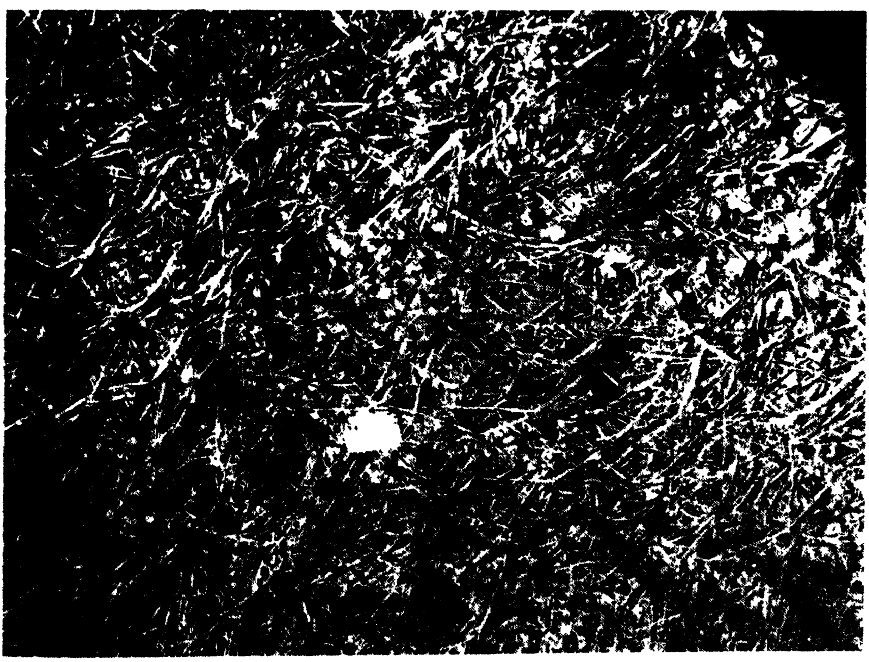
Age Class.	A.I.S.		Guernsey.		Jersey.		All Breeds.	
	No. of Cows Tested.	No. Passing Standard.	No. of Cows Tested.	No. Passing Standard.	No. of Cows Tested.	No. Passing Standard.	No. of Cows Tested.	No. Passing Standard.
Mature ...	46	13	43	18	71	31	160	62
Senior 4 years	18	3	14	5	21	11	53	19
Junior 4 years ...	12	3	16	4	18	6	46	13
Senior 3 years	11	6	12	8	17	10	40	24
Junior 3 years	26	11	18	14	29	17	73	42
Senior 2 years...	29	12	6	4	30	25	65	41
Junior 2 years	68	27	37	23	56	39	161	89
Total ...	210	75	146	76	242	139	598	290
Percentages	35.7		52.1		57.4		48.5	



Uneven growth shows the need for renovation and harrowing—Waroona.



A good pasture, a mixture of Subterranean Clover and Wimmera Rye Grass—Armadale.



Irrigated Pasture: Cocksfoot, Perennial Rye Grass, White and Strawberry Clovers—Waroona.

The average production of milk and butterfat in each age group of each breed is shown in Table 4.

TABLE 4.

AVERAGE PRODUCTION IN EACH AGE CLASS, 1948–49.

AGE CLASS.	Butter-fat Standard Required lb.	A.I.S.				Guernsey.			
		No. of Cows.	Average Milk lb.	% Test.	Average Butter-fat. lb.	No. of Cows.	Average Milk lb.	% Test.	Average Butter-fat. lb.
Mature	350	46	7,484	3·95	295·92	43	6,359	5·19	330·53
Senior 4 years	330	18	7,522	3·75	282·27	14	6,285	5·07	319·25
Junior 4 years	310	12	7,302	4·05	296·21	16	5,812	5·07	294·99
Senior 3 years . .	290	11	7,178	3·91	280·93	12	6,450	5·47	353·22
Junior 3 years .	270	26	6,365	4·05	257·96	18	6,464	5·19	336·02
Senior 2 years . .	250	29	5,995	3·92	235·17	6	5,562	5·27	293·34
Junior 2 years .	230	68	5,376	3·99	214·94	37	5,014	5·19	260·17
TOTAL	....	210	6,434	3·95	254·68	146	5,939	5·19	308·73

AGE CLASS.	Butter-fat Standard Required lb.	Jersey.				All Breeds.			
		No. of Cows.	Average Milk lb.	% Test.	Average Butter-fat. lb.	No. of Cows.	Average Milk lb.	% Test.	Average Butter-fat. lb.
Mature ...	350	71	6,328	5·00	329·16	160	6,655	4·81	319·29
Senior 4 years .	330	21	5,916	5·52	326 56	53	6,557	4·72	309·59
Junior 4 years	310	18	5,611	5·24	294·46	46	6,122	4·82	295·10
Senior 3 years	290	17	6,111	5·30	323·99	40	6,506	4·91	320·92
Junior 3 years	270	29	5,578	5·56	310·57	73	6,077	4·90	298·11
Senior 2 years ..	250	30	5,541	5·56	308·07	65	5,746	4·77	274·19
Junior 2 years ..	230	56	4,941	5·40	267·28	161	5,129	4·76	244·16
TOTAL	....	242	5,715	5·37	306·84	598	6,022	4·79	288·98

It will be seen that the average for all breeds in the age groups mature, senior four and junior four is below standard.

In the A.I.S. breed the average was below standard in all age groups while the Guernseys and Jerseys exceeded standard in the three year old and two year old groups, the senior three year old Guernseys did particularly well with an average of 353.22 lb. of butterfat. The senior two year old Jerseys also put up a creditable performance with an average of 308.07 lb. of butterfat.

The average milk per cow for all breeds was 364 lb. less than the previous year.

A comparison between the production of cows under test 150 days and over with cows completing 273 days, according to breed and age class is given in Table 5. The 273 day averages reveal that all age groups in each breed exceeded standard butterfat production.

Six senior three year old Guernseys averaged 410.25 lb. and 13 senior four year old Jerseys averaged 409.34 lb. of butterfat. Of the 598 cows under test 150 days or more, 397 or 66.4 per cent. completed 273 days; this is 6.2 per cent. less than last year.

TABLE 5.

COMPARATIVE TABLE SHOWING AVERAGE PRODUCTION IN EACH AGE CLASS OF COWS UNDER TEST 150 DAYS OR OVER AND COWS COMPLETING 273 DAYS.

Age Class.	Standard Butterfat Required.	A.I.S.				Guernsey.			
		No. of Cows Tested 150 days or over.	Average Butterfat. lb.	No. of Cows Completing 273 days.	Average Butterfat. lb.	No. of Cows Tested 150 days or over.	Average Butterfat. lb.	No. of Cows Completing 273 days.	Average Butterfat. lb.
Mature	350	46	295 ·92	19	367 ·87	43	334 ·07	34	361 ·08
Senior 4 years	330	18	282 ·27	9	336 ·49	14	319 ·25	9	371 ·75
Junior 4 years	310	12	296 ·21	7	344 03	16	294 ·99	11	341 ·38
Senior 3 years	290	11	280 ·93	7	319 ·06	12	358 ·22	6	410 ·25
Junior 3 years	270	26	257 ·96	17	296 ·58	18	336 ·02	15	346 ·06
Senior 2 years	250	29	235 ·17	16	270 ·40	6	293 34	5	316 ·76
Junior 2 years	230	68	214 ·94	45	237 65	37	260 ·17	21	326 ·12
Averages		210	254 ·68	120	289 ·48	146	308 73	101	351 ·11
With Allowances			293 ·49		337 ·57		346 ·76	.	391 ·82

Age Class.	Standard Butterfat Required.	Jersey.				All Breeds.			
		No. of Cows Tested 150 days or over.	Average Butterfat. lb.	No. of Cows Completing 273 days.	Average Butterfat. lb.	No. of Cows Tested 150 days or over.	Average Butterfat. lb.	No. of Cows Completing 273 days.	Average Butter fat. lb.
Mature	350	71	329 ·16	52	363 ·24	160	319 ·29	105	363 ·37
Senior 4 years	330	21	192 ·03	13	409 ·34	53	309 ·59	31	377 ·27
Junior 4 years	310	18	216 ·92	14	316 ·61	46	295 ·10	32	331 ·12
Senior 3 years	290	17	323 ·99	11	333 ·57	40	320 92	24	348 ·50
Junior 3 years	270	29	310 ·57	20	328 ·86	73	298 11	52	342 ·50
Senior 2 years	250	30	308 ·07	23	324 ·21	65	274 ·19	44	303 ·76
Junior 2 years	230	56	267 ·28	43	291 ·34	161	244 ·16	109	276 ·05
Averages		242	306 ·84	176	345 ·92	598	288 ·98	397	330 ·14
With Allowances	.	....	347 ·40		379 ·28	.	328 ·32	.	369 ·85

The leading sire for the year was for the third successive year the Jersey Bull "Mornmoot Northwood Beau" owned by R. H. Rose and Son. His six best daughters averaged with allowances 569.10 lb. of butterfat. He was followed by "Juadine Royal" (Jersey) owned by G. Layman, 511.97 lb. of butterfat and "Koojan Ace's Warspite" owned by the Denmark Research Station with 509.56 lb. of butterfat.

Average of the six best and all daughters of each sire is shown in Table 6.

TABLE 6.

LEADING THREE SIRES, 1948-49.

Name of Bull.	Owner.	Sire.	Dam.	Average Production of six best daughters.		Average Production of all daughters under test.		
				Without allowances (lb. butter-fat.)	With allowances (lb. butter-fat.)	No. of Daughters under Test.	Without allowances lb. butter-fat.)	With allowances (lb. butter-fat.)
Mornmoot Northwood Beau (Jersey) (17798)	R. H. Rose & Son	Glen Iris Golden Beau (14629)	Mornmoot Northwood Madeira 7th (63202)	528 .39	569 .10	18	401 .18	439 .83
Juadine Royal (Jersey) (20841)	G. Layman	Navua Royal Star (15869)	Juadine Queen (87022)	423 .24	511 .97	8	391 .08	472 .48
Koojan Ace's Warspite (Guernsey) (5943)	Denmark Research Station	Homestead Ace (Imp.) U.S.A. (1631)	Koojan Ideal's Jewel (7257)	406 .32	509 .56	9	386 .75	467 .92

The productions of the three leading cows in each age group are shown in Table 7. One was over 700 lb. of butterfat, three over 600 lb., eight over 500 lb. and 8 over 400 lb. Of the 21 cows, ten are Jerseys, ten Guernseys and one A.I.S.

TABLE 7.

THREE LEADING COWS IN EACH AGE CLASS, 1948–49.

Name of Cow.	Breed.	Milk. lb.	Average Test. %	Butter-fat. lb.	Owner.
MATURE (STANDARD 350 LB. BUTTERFAT).					
Mokine Beauty ...	Jersey	11127	5·94	661·13	T. H. Wilding
Congelin Rose Marie 6th ..	Jersey	10068	6·25	629·14	D. Bradford
Grass Vale Lady Fowler 33rd .	Jersey	11574	5 18	601·09	R. H. Rose & Son
SENIOR 4 YEAR OLD (330 LB. BUTTERFAT).					
Koojan Noblemark's Bo Peep .	Guernsey	9855	5·76	567·97	A. W. Padbury
Grassvale Eve ..	Jersey	8802	5·88	517 38	R. H. Rose & Son
Grassvale Golden Cream 26th	Jersey	8397	6 00	504·57	R. H. Rose & Son
JUNIOR 4 YEAR OLD (310 LB. BUTTERFAT).					
Marrivale Anne	Guernsey	9108	6 56	598 14	W. J. Smith
River Glen Clarabelle 67th	A.I.S.	11184	4·35	487 27	M. H. Montgomery
Muresk Veronica .	Guernsey	8439	5·33	449·46	Muresk Agricultural College
SENIOR 3 YEAR OLD (290 LB. BUTTERFAT).					
Denmark Ace's Velvet .	Guernsey	11443	6·54	748·93	Denmark Research Station
Grassvale Buttercup 17th	Jersey	10359	5·47	566 71	R. H. Rose & Son
Denmark Ace's Dawn 3rd	Guernsey	8445	5·39	455·52	Denmark Research Station
JUNIOR 3 YEAR OLD (270 LB. BUTTERFAT).					
Carydale Royal Queen	Jersey	10261	5 75	590·29	G. Layman
Denmark Aristocrat's Valencia	Guernsey	9462	5 14	486·70	Denmark Research Station
Muresk Lady Ideal .	Guernsey	8406	5 35	449 93	Muresk Agricultural College
SENIOR 2 YEAR OLD (250 LB. BUTTERFAT).					
Carydale Royal Princess	Jersey	9769	5 43	530·57	G. Layman
Colmyn Jewel .	Jersey	7644	5·95	454·85	C. H. Ironmonger
Trelawney Lightly ..	Jersey	6811	5·71	389·18	J. C. Bushell
JUNIOR 2 YEAR OLD (230 LB. BUTTERFAT).					
Marrivale Vera .	Guernsey	7450	6·85	510 78	W. J. Smith
Denmark Ace's Valencia .	Guernsey	7704	5 70	439·80	Denmark Research Station
Muresk Marielena .	Guernsey	7443	5·84	434·46	Muresk Agricultural College

New Records.

Five new records were established during the year.

Silage provides a succulent feed for summer feeding—Armadale.

Hay Baling. An automatic pick-up baler in action—York.

A power mower cutting oats, lucerne and clover for silage—Armadale.

Jersey (Senior 2 year old class).

"Carydale Royal Princess," owned by G. Layman, in producing 9,769 lb. of milk, average test 5.45 per cent. and 530.57 lb. of butterfat exceeded the previous record in this class, held since 1924 by Jean 2nd, of Grassvale whose production was 8701 lb. of milk, average test 5.84 per cent. and 508.93 lb. of butterfat.

The dam of "Carydale Royal Princess" was "Colmyn Janis 2nd" and her sire "Juadine Royal." "Juadine Royal's" dam "Juadine Queen" held the Junior two year old record (Jersey) in 1943.

"Carydale Royal Princess" now holds the following State Records, Senior and Junior two year old classes (Jersey Breed), West Australian Breed (Junior two year old) and all Breeds Junior two year old.

Guernsey (Junior 2 year old class).

"Marrivale Vera,' owned by W. J. Smith of Denmark established a new record in this class, her production being 7450 lb. of milk, average test 6.85 per cent. and 510.78 lb. of butterfat. The previous record in this class was held by "Koojan Ideal's Daphne" with 489.13 lb. of butterfat.

"Marrivale Vera" is by Denmark Ace's Image," her dam being "Marrivale Dawn."

TABLE 8—PURE BRED HERD TESTING.

Cows which completed test during the 12 months ended 30th June, 1949.

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS UNDER 2¼ YEARS—STANDARD 230 LBS. BUTTERFAT.											
Marrivale Vera	Guernsey	16043	9-3-46	25-5-48	273	13.5	7,450	6.85	510 78	W. J. Smith	Denmark Ace's Image (5741)
Denmark Ace's Valencia	do.	15651	12-3-46	17-6-48	273	18 0	7,704	5.70	439 80	Denmark Research Station	Demark Ace (5738)
Muresk Marielena	do.	16152	25-7-46	29-9-48	273	21.0	7,443	5.84	434 46	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Grassvale Silvermine 6th	Jersey	.	1-4-46	25-7-48	273	13.5	7,165	6 03	432.40	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Trelawney Starbright 2nd	do.		7-6-46	31-7-48	273	21 0	7,203	5 99	431 34	J. C. Bushell	Juadine Commander (1397)
Eungella Miss Marinora 2nd	do.		25-4-46	21-5-48	273	17 5	7,552	5.67	428 04	D. G. Spark ...	Hopelands Marinora's Star (20814)
Muresk Diamond Lass 2nd	Guernsey		24-5-46	12-5-48	273	25 0	7,725	5 39	416 08	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Kapara Sweet Briar 2nd	Jersey		8-5-46	2-7-48	273	23 0	7,899	5 23	412 92	D. Bradford	Congelin Washington (18426)
Muresk Minnie	Guernsey	16153	27-6-46	11-10-48	273	21 0	7,953	5 12	407 46	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Denmark Reflection's Marion	do.	15653	4-2-46	24-6-48	273	18 0	6,204	5.97	370.96	Denmark Research Station	Koojan Ideal's Reflection (4974)
Denmark Reflection's Ripple	do.		23-6-46	20-8-48	273	14 5	5,998	6 01	360 72	do. do.	do. do. do.
Eungella Gaiety Girl	Jersey		24-4-46	21-5-48	273	14 0	7,136	4 94	352 72	D. G. Spark	Hopelands Marinora's Star (20814)
Wooroloo Sapphire 2nd	A.I.S.	54746	5-1-46	9-6-48	273	18 0	8,394	4.19	351 91	Wooroloo Sanatorium Farm	Glanavon Fusilier (8106)
Koojan Whirlwind's Trixie	Guernsey	15900	9-9-45	6-11-47	273	22 0	7,026	5 00	351 68	A. W. Padbury	Koojan Ace's Whirlwind (7447)
Koojan Ace's Bramble	do.	15877	8-9-45	2-12-47	273	24 0	6,822	5 14	350 45	do.	Homestead Ace (Imp. 1631)
Eungella Ballerina	Jersey		21-4-46	10-5-48	273	16 0	6,683	5 23	349 66	D. G. Spark	Hopelands Marinora's Star (20814)
Muresk Morning Glory 2nd	Guernsey	16154	26-1-46	11 2-48	273	24 0	6,372	5 46	348 35	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Muresk Diana 2nd	do.	16143	26-1-46	28-4-48	273	22 0	7,506	4 58	344 27	do. do.	Koojan Ideal's Dictator (4167)
Wooroloo Patsy 4th	A.I.S.	54738	1-3-46	20-7-48	273	16 0	8 028	4 27	342.59	Wooroloo Sanatorium Farm	Glanavon Fusilier (8106)
Wooroloo Laureen	A.I.S.	54729	27-3-46	12-9-48	273	24 0	7,962	4 25	338 72	do. do.	do. do. do.
Travalgan Lady Eion 36th	Jersey	.	17-7-46	4-8-48	273	13 0	5,499	6 08	334 32	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Eungella Annette	do.		16-7-46	9-5-48	273	12 5	6,262	5 32	333 48	D. G. Spark	Hopelands Marinora's Star (20814)
Travalgan Starbright 38th	do.		14-6-46	24-6-48	273	12 0	5,436	6 09	331 26	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Grassvale Lady Fowler 47th	do.	...	31-5-46	24-6-48	273	11 0	5,658	5 67	321 01	R. H. Rose & Son	Glen Iris Golden Oxford (12694)
Carydale Royal Twinkle	do.		14-3-46	28-3-48	273	19 5	6,478	4 89	317 03	G. Layman	Juadine Royal (20841)
Travalgan Starbright 34th	do.	....	26-5-46	16-6-48	273	10 0	5,760	5 44	313 59	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Denmark Aristocrat's Reflectionette	Guernsey		7-5-46	5-8-48	273	13 0	5,429	5.77	313 49	Denmark Research Station	Denmark Ace's Aristocrat (5740)
Walgett Handsome Girl 44th	Jersey	..	1-5-46	27-5-48	273	12 5	5,992	5.22	312.76	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Kapara Rose Marie	do.		11-4-46	29-5-48	273	16 0	5,193	5.93	307.78	D. Bradford	Congelin Mandarin (14542)
Chillwell Zena's Daphne	do.	..	1-8-45	9-10-47	273	15 0	5,360	5.73	307.59	Mrs. M. A. Watson	Travalgan Leader (958)

Claremont Mavis 12th	A.I.S.	...	11-11-45	10-4-48	273	24 0	7,902	3.86	305.23	Wooroloo Sanatorium Farm	Westby Masterpiece (5403)
Eungella Lynette	Jersey		6-8-46	12-7-48	273	6 0	5,688	5.37	305.22	D. G. Spark ..	Hopelands Marinora's Star (20814)
Rutherwood Rosebud 2nd	Guernsey	16483	7-3-46	9-6-48	273	12 0	6,576	4.61	303.51	G. Brenton ..	Koojan Ace's Sunshade (5942)
Kapara Duchess 4th ..	Jersey	..	11-5-46	4-6-48	273	19 0	5,997	5.04	302.21	D. Bradford	Congelin Washington (18426)
Eungella Athena	do.	....	14-5-46	24-5-48	273	11.0	4,773	6.29	300.54	D. G. Spark	Hopelands Marinora's Star (20814)
Glanavon Fairy 13th ..	A.I.S.	....	16-5-45	19-10-47	273	22 0	7,176	4.12	295.87	D. Bevan & Sons ..	Glanavon Tranter (8121)
Koojan Ace's Beauty	Guernsey	15875	28-8-45	1-3-48	240	28 0	5,895	5.05	295.32	R. J. Giles	Homestead Ace (Imp. 1631)
Claremont Whitby Maiden 5th	A.I.S.	...	2-2-46	28-5-48	273	22 0	6,936	4.22	292.56	Claremont Hospital for Insane	Glanavon Dunster (6867)
Korijekup Norma	Jersey	....	10-10-45	29-1-48	273	23 0	6,369	4.56	290.67	A. G. Eckersley	Navua Royal star (15869)
Carydale Royal Camella	do.		1-3-46	19-5-48	240	15 5	5,400	5.37	290.46	G. Layman	Juadine Royal (20841)
Rutherwood Daisy 2nd	Guernsey	16426	27-3-46	19-5-48	273	12 0	5,286	5.44	287.53	G. Brenton	Koojan Ace's Sunshade (5942)
Walgett Handsome Girl 46th	Jersey		26-5-46	9-5-48	273	16 0	5,283	5.44	287.49	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Wooroloo Doreen 8th	A.I.S.	54718	12-6-46	23-9-48	273	20 0	6,636	4.31	285.94	Wooroloo Sanatorium Farm	Glanavon Fusilier (8106)
Denmark Reflections Velvet	Guernsey	15654	19-11-45	12-3-48	273	19 0	5,352	5.34	285.61	Denmark Research Station	Koojan Ideal's Reflection (4974)
Rosella Fairy	do.		28-4-46	30-4-48	273	8 5	5,350	5.32	284.80	Darnell Bros.	Koojan Ace's Roosevelt (7439)
Walgett Proud Fairy ..	Jersey		23-4-46	28-6-48	273	11 5	5,674	5.02	284.77	C. J. Cunningham .	Mornmoot Paxie's Captain 2nd (697)
Travalgan Lady Mint 10th	do.		22-8-46	15-8-48	273	9 0	4,767	5.91	281.75	W. H. & F. T. Robinson	Mornmoot Laver (17792)
Amaroo Cleo	do.		9-5-46	17-5-48	273	8 0	6,039	4.65	280.73	T. O. Abbott	Eungella Golden Starbright (20666)
Travalgan Starbright 36th	do		30-5-46	12-6-48	273	9 0	4,647	5.98	278.05	W. H. & F. T. Robinson	Mornmoot Laver (17792)
Travalgan Starbright 39th	do.		1-8-46	20-8-48	273	11 0	4,863	5.71	277.77	do. do.	do. do. do.
Claremont Lily 13th	A.I.S.	.	26-11-45	13-4-48	273	18 0	6,894	3.94	271.91	Wooroloo Sanatorium Farm	Westby Monarch (5404)
Tipperary Gem .	A.I.S.		26-5-46	19-5-48	273	17 0	7,221	3.76	271.77	W. G. Burges	Parkview Mosaic (6080)
Tipperary Dove 34th	do.		25-2-46	15-5-48	273	17 0	6,426	4.21	270.51	do	Glanavon Povey (8114)
Colmyn Chloe	Jersey		23-8-46	14-9-48	273	14 0	5,492	4.88	268.35	C. H. Ironmonger	Eungella Prince Starbright (19538)
Travalgan Attraction	do.		1-8-45	25-11-47	273	26 0	4,500	5.96	268.13	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Walgett Handsome Girl 47th	do.		26-6-46	29-6-48	273	11 0	5,133	5.22	267.86	C. J. Cunningham	Mornmoot Paxie's Captain 2nd (697)
Rutherwood Maid Marion 2nd	Guernsey	16435	29-5-46	3-6-48	240	14 0	6,120	4.35	266.19	G. Brenton	Koojan Ace's Sunshade (5942)
Walgett Golden Glory	Jersey		31-3-46	27-5-48	273	10 0	5,310	5.00	266.17	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Glanavon Doris 22nd	A.I.S.		25-12-45	2-11-47	273	21 0	6,513	4.06	264.99	D. Bevan & Sons	Glanavon Fairy's Triumph (8105)
Korijekup Opal	Jersey		19-10-45	12-2-48	273	16 0	5,433	4.87	264.70	A. G. Eckersley	Navua Royal Star (15869)
Claremont Clara 28th	A.I.S.		21-2-46	27-5-48	273	18 0	6,189	4.25	262.98	Claremont Hospital for Insane	Westby Masterpiece (5403)
Kapara Fairy Queen	Jersey		21-4-46	29-6-48	273	13 0	4,689	5.59	262.28	D. Bradford	Congelin Washington (18426)
Claremont Cherry 49th	A.I.S.		16-4-46	2-8-48	273	15 0	6,135	4.25	260.78	Claremont Hospital for Insane	Westby Masterpiece (5403)
Southlyn Winnefra	do.		26-8-46	7-6-48	273	7 0	6,321	4.11	259.59	J. H. Bensted & Co	Capel Rose's Star (7902)
Wooroloo Waratah	do.	54755	28-9-45	7-3-48	273	13 0	5,739	4.48	257.36	Wooroloo Sanatorium Farm	Glanavon Fusilier (8106)
Wooroloo Ailsa	do.	54712	25-5-46	19-9-48	273	16 0	5,628	4.55	256.31	do. do.	Wooroloo Baron's Reward (8870)
Travalgan Lady Elon 37th	Jersey		15-9-46	24-8-48	273	11 0	4,680	5.47	256.11	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Wooroloo Red Glow	A.I.S.	54744	5-1-46	7-3-48	273	18 0	5,934	4.29	254.66	Wooroloo Sanatorium Farm	Glanavon Fusilier (8106)
Rosella Melba	Guernsey		28-9-46	23-7-48	273	13 5	4,995	5.00	249.99	Darnell Bros.	Koojan Ace's Roosevelt (7439)
Travalgan Starbright 35th	Jersey		27-5-46	5-7-48	273	8 0	4,674	5.34	249.92	W. H. & T. F. Robinson	Mornmoot Laver (17792)

TABLE 8—PURE HERD TESTING—*continued.*

Cows which completed test during the twelve months ended 30th June, 1949—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS UNDER 2½ YEARS OLD—STANDARD 230 LB. BUTTER-FAT—*continued.*											
Rutherwood Golden Dawn 2nd	Guernsey	16430	11–5–46	21–8–48	210	15.0	5.610	4 45	249 03	G. Brenton	Denmark Golden Rippler (5751)
Travalgan Starbright 37th .	Jersey	..	31–5–46	18–6–48	273	10 0	4,500	5.52	248.74	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Kapara Tangerine	Jersey	....	26–9–46	24–7–48	273	12.0	4,236	5.87	248.68	D. Bradford .	Grassvale Twylish Lad (21816)
Claremont Poppy 44th ..	A.I.S.	..	25–9–45	12–12–47	273	23 0	6,864	3.58	245 96	Claremont Hospital for Insane	Capel Monarch (7898)
Clovelly Stella	Guernsey		12–5–46	15–6–48	273	6 0	5,133	4 76	244.43	J. Cabassi	Pleasant Banks Windsor (7820)
Glanavan Buttercup 13th ..	A.I.S.	...	19–10–45	17–3–48	150	48 0	6.585	3.70	243 63	D. Bevan & Sons	Glanavon Lord (8109)
Claremont Maggie Morrison 78th	A.I.S.	.	4–3–46	24–5–48	273	15.0	5,940	4.09	243.28	Claremont Hospital for Insane	Westby Masterpiece (5403)
Claremont Maggie Morrison 76th	do.	..	13–2–46	2–6–48	273	17.0	6.801	3.58	243.20	do. do.	Westby Monarch (5404)
Tirano Katoomba 3rd ..	do.		5–2–46	15–6–48	273	12 5	5,737	4.21	241.72	J. H. Bensted & Co. ...	Wooroloo Clansman (8874)
Mayvale Golden Bell	Guernsey	16048	11–12–45	10–5–48	273	17 5	5,257	4 59	241 51	R. J. Giles	Koojan Ideal's Discoverer (4968)
Kapara Madeira	Jersey	.	16–7–46	7–4–48	273	16 0	4,788	5.02	240.75	W. L. Bradford .	Grassvale Twylish Lad (21816)
Colmyn Diana	do.	...	23–8–46	12–8–48	273	8 5	4.570	5.26	240.34	C. H. Ironmonger	Eungella Prince Starbright (19538)
Claremont Maggie Morrison 77th	A.I.S.	.	3–3–46	30–6–48	273	23 0	6,654	3.61	240 14	Claremont Hospital for Insane	Westby Masterpiece (5403)
Wattlehill Velvet	do.	..	15–8–46	11–7–48	273	15 5	6,706	3 56	238.84	K Prowse ..	Capel Cinderella King 2nd (7892)
Claremont Blossom 50th .	do.	.	16–10–45	23–11–47	273	24 0	6,492	3 65	237.16	Claremont Hospital for Insane	Capel Monarch (5404)
Grass Vale Lady Flower 50th	Jersey		2–8–46	21–8–48	180	12 5	4,530	6 03	237 15	R. H. Rose & Son ..	Mornmoot Northwood Beau (17798)
Whitmore Girlie 2nd ...	Guernsey	16673	10–5–46	6–7–48	240	15 0	4,710	5 02	236.40	J. R. Giles	Lansdowne Dymphna's Climax (5963)
Tipperary Beauty 25th ..	A.I.S.	...	27–4–46	19–5–48	273	12.0	5,286	4.42	233.72	W. G. Burges	Tipperary Ace (6336)
Doyson's Princess	do.	....	30–3–46	28–5–48	240	15.0	5,835	3 96	231.12	W. H. Doyle & Son .	Wooroloo Noble 4th (6411)
Claremont Star 38th ...	do.	.	21–7–45	12–12–47	273	9 0	6,012	3 81	229.08	Claremont Hospital for Insane	Westby Monarch (5404)
Wooroloo Manequin	do.	54733	23–4–46	22–9–48	273	13.0	5,109	4 45	227.39	Wooroloo Sanatorium Farm	Wooroloo Morning Star (8882)
Claremont Poppy 46th	do.	....	11–3–46	30–5–48	273	15.5	6.616	3 42	226.20	Claremont Hospital for Insane	Claremont Admiration (7923)
Claremont Mabel 37th ...	do.	.	25–2–46	30–5–48	273	19 5	6,598	3 37	222 61	do. do.	Westby Masterpiece (5403)
Kapara Sweet Nell	Jersey		17–7–46	5–4–48	273	15 0	4,530	4.89	221 71	W. L. Bradford ..	Grass Vale Twylish Lad (21816)
Kapara Valentine 2nd ...	do.	...	15–6–46	1–5–48	273	7 0	4,491	4 93	221 68	do. do.	Grass Vale Twilight Laddie
Narrogin Chrissie	A.I.S.	..	15–4–46	3–6–48	240	19 0	5,100	4.32	220 14	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Denmark Ace's Pekette	Guernsey	.	7–7–46	25–9–48	273	4 0	3.537	6.21	219 63	Denmark Research Station	Denmark Ace (5738)
Chillwell Mignonette Mimosa	Jersey	.	16–7–46	23–9–48	273	10 5	3,796	5 74	218 05	Mrs. M. A. Watson	Travalgan Leader (958)
Claremont Maggie Morrison 75th	A.I.S.	.	20–1–46	10–4–48	273	5.0	5,265	4.10	215.98	Wooroloo Sanatorium Farm	Glanavon Dunster (6867)

Claremont Treasure 52nd	do.	..	1-3-46	12-7-48	273	12 5	5,917	3.63	215.21	Claremont Hospital for Insane	Westby Masterpiece (5403)
Rutherwood Daffodil 2nd	Guernsey		19-6-46	27-5-48	273	12 0	4,666	4.59	214.53	Misses E. & I. Rutherford	Koojan Ace's Sunshade (5942)
Amaroo Troy	Jersey		22-4-46	27-5-48	273	6 0	4,083	5.23	213.76	T. O. Abbott	Eungella Golden Starbright (20666)
Claremont Mabel 36th	A.I.S.	...	27-1-46	9-5-48	273	11 5	5,629	3.79	213.71	Claremont Hospital for Insane	Westby Monarch (5404)
Glanavon Dahlia 33rd	do.		18-12-45	17-11-47	273	10 0	4,920	4.30	211.97	D. Bevan & Sons	Glanavon Godfrey (8108)
Rutherwood Golden Butterfly 2nd	Guernsey		15-5-46	21-8-48	210	11 0	4,050	5.22	211.62	G. Brenton	Koojan Ace's Sunshade (5942)
Wooroloo Petal	A.I.S.	54739	12-4-46	12-9-48	240	10 0	4,680	4.36	203.94	Wooroloo Sanatorium Farm	Glanavon Fusilier (8106)
Mereworth Bravo Silvermine	Jersey		25-6-45	22-12-47	273	19 0	3,317	6.13	203.56	B. Langridge	Grantham Easter's Marchalong (20736)
Walgett Handsome Girl 43rd	do.		19-4-46	21-6-48	240	9 5	3,950	5.08	199.62	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Murra Murra Northwood Dewdrop 2nd	do.		10-4-46	18-8-48	150	19 0	3,990	4.98	198.33	Mrs. M. A. Crute	The Wold Northwood King (19138)
Doyson's Pansy 2nd	A.I.S.		1-5-46	17-5-48	210	13 5	4,320	4.55	196.65	W. H. Doyle & Son	Wooroloo Noble 4th (6411)
Capel Empress Pretty	do.	49401	7-9-46	2-5-48	273	18 5	5,845	3.36	196.38	J. H. Bensted & Co.	Capel Rose's Star (7902)
Claremont Clarie 6th	do.		28-4-46	8-8-48	273	18 5	5,635	3.48	195.93	Claremont Hospital for Insane	Capel Monarch (7898)
Murra Murra Marinita	Jersey		4-4-46	30-8-48	150	12 5	3,315	5.90	195.63	Mrs. M. A. Crute	The Wold Northwood King (19138)
Claremont Stella 14th	A.I.S.		19-7-45	23-11-47	273	19 0	5,172	3.74	193.81	Claremont Hospital for Insane	Claremont Wilton's Choice (7957)
Chillwell Betty's Heather	Jersey		12-7-46	1-9-48	180	12 0	3,315	5.84	193.50	Mrs. M. A. Watson	Travalgan Leader (958)
Narrogin Lady	A.I.S.		21-4-46	19-4-48	240	16 0	4,980	3.86	192.15	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Claremont Maggie Morrison 80th	do.		22-4-46	8-8-48	273	14 0	4,932	3.89	192.06	Claremont Hospital for Insane	Glanavon Dunster (6867)
Claremont Whitby Maid 64th	do.		24-8-45	19-10-47	273	14 0	5,232	3.66	191.83	do. do.	Westby Monarch (5404)
Yalebra Baronia	Jersey		20-4-46	5-6-48	273	10 0	4,440	4.31	191.52	K. V. Gray	Radyr Park June Lad (26494)
Claremont Biddy 92nd	A.I.S.		20-10-46	29-8-48	273	14 5	5,008	3.77	188.82	Claremont Hospital for Insane	Wooroloo Night Fighter (8884)
Narrogin Mignonette	do.		27-2-46	29-4-48	240	15 0	4,380	4.24	185.78	Narrogin School of Agriculture	Wooroloo Gay Gordon (18878)
Yalebra Fairy Princess	Jersey		27-4-46	25-8-48	180	11 0	3,060	6.06	185.43	K. V. Gray	Glanavon Diana's Lad (373)
Amaroo Diana	do.		5-5-46	15-9-48	150	14 0	3,345	5.52	184.56	T. O. Abbott	Amaroo Winner
Murra Murra Silver Bell 2nd	do.		5-4-46	2-10-48	120	14 0	3,045	4.87	184.41	Mrs. M. A. Crute	The Wold Northwood King (19138)
Claremont Biddy 90th	A.I.S.		27-5-46	21-8-48	273	14 5	4,498	4.09	184.02	Claremont Hospital for Insane	Wooroloo Night Fighter (8884)
Narrogin Sybil	do.		13-3-46	16-4-48	240	13 0	4,440	4.14	183.78	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Alne Bank Audrey 15th	do.		13-3-46	28-1-48	273	14 0	4,647	3.95	183.66	G. W. Marston	Alne Bank Glen (6449)
Yalebra Goldilocks	Jersey		18-7-46	3-8-48	210	7 0	3,045	5.96	181.64	K. V. Gray	Grass Vale Beau
Narrogin Diamante	A.I.S.		8-4-46	4-6-48	210	18 0	4,830	3.76	181.59	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Lenmoor's Nancy 4th	do.		18-7-46	7-7-48	240	8 5	4,170	4.29	178.98	G. W. Marston	Wooroloo Union Jack (7662)
Narrogin Marabelle	do.		11-3-46	26-5-48	210	17 0	4,140	4.26	176.43	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Claremont Pinafore 22nd	A.I.S.		29-3-46	29-9-48	273	14 5	5,173	3.40	176.09	Claremont Hospital for Insane	Capel Monarch (7898)
Narrogin Coquette	do.		11-3-46	26-1-48	273	6 0	4,388	4.01	176.05	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Narrogin Mayflower	do.		30-3-46	27-5-48	210	14 0	2,930	4.35	171.06	do. do.	do. do. do.
Lenmoor's Joan 4th	do.		26-2-46	21-7-48	150	13 0	4,275	3.99	170.70	G. W. Marston	Wooroloo Union Jack (7662)

TABLE 8—PURE BRED HERD TESTING—*continued.*

Cows which completed test during the twelve months ended 30th June, 1949—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS UNDER 2½ YEARS OLD—STANDARD 230 LB. BUTTER-FAT—*continued.*											
Rutherwood Dinah 2nd	Guernsey		11-5-46	26-8-48	210	11.0	3,810	4.48	170.64	G. Brenton	Denmark Robin Hood
Benger Alice	A.I.S.		4-9-46	23-7-48	240	6.0	4,050	4.17	168.93	W. K. Barnes	Carbunnup Governor (9139)
Claremont Star 39th	do.		15-5-46	12-8-48	150	18.0	4,320	3.83	165.54	Claremont Hospital for Insane	Wooroloo Night Fighter (8884)
Rutherwood Dame 2nd	Guernsey		9-5-47	3-9-48	210	10.0	3,630	4.55	165.33	G. Brenton	Koojan Ace's Sunshade (5942)
Murra Murra Royal Lady 2nd	Jersey		4-7-46	23-8-48	150	13.0	3,135	5.21	163.38	Mrs. M. A. Crute	The Wold Northwood King (19138)
Chelsea Blonde	Guernsey		26-4-46	6-10-48	180	10.0	3,135	5.14	161.31	W. D. Patmore	Denmark Briar's Reflection (5745)
Chelsea Velvet	do.		29-6-46	29-6-48	180	12.5	3,450	4.59	158.49	do. do.	do. do. do.
Durrimba Gwenny	Jersey		16-8-46	15-8-48	120	26.0	3,360	4.46	150.03	F. Campbell	Grantham Airman
Narrogin Flirt	A.I.S.		5-6-46	2-6-48	210	8.0	3,840	3.91	150.03	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Tipperary Lovely 12th	do.	54212	19-3-46	25-8-48	210	12.0	3,510	4.28	149.55	W. G. Burges	Glanavon Trevor
Mayvale Ideal's Bluebell	Guernsey	16050	31-7-46	21-12-48	150	11.0	3,165	4.63	146.58	R. J. Giles	Koojan Ideal's Discoverer (4968)
Murra Murra Marinora	Jersey		19-4-46	16-9-48	120	17.5	3,180	4.56	145.02	Mrs. M. A. Crute	The Wold Northwood King (19138)
Camden Lorelei	do.		22-9-46	30-6-48	240	8.0	2,775	5.02	139.29	K. V. Gray	Greenmount Starbright (20748)
Tipperary Peggy 4th	A.I.S.		30-11-45	27-5-48	210	7.0	3,570	3.88	138.60	W. G. Burges	Tipperary Ace (6336)
Lenmoor's Queen 6th	do.		20-2-46	1-3-48	273	6.5	3,660	3.76	137.94	G. W. Marston	Wooroloo Union Jack (7662)
Yalebra Queen 3rd	Jersey		20-5-46	31-7-48	210	5.0	2,505	5.47	137.07	K. V. Gray	Juadine Volunteer (20842)
Narrogin Cora	A.I.S.		22-5-46	20-2-48	240	8.0	3,480	3.91	136.05	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Chillwell Marigold Dawn	Jersey		15-3-46	1-8-48	150	12.5	2,340	5.76	134.79	Mrs. M. A. Watson	Travalgan Leader (958)
Glanavon Dahlia 34th	A.I.S.	50501	27-5-46	14-2-48	180	16.0	3,210	4.06	130.50	D. Bevan & Son	Blacklands Jean's Supreme (1871)
Lenmoor's Bluebell 2nd	do.		26-5-46	27-12-47	273	6.5	3,099	4.19	129.93	G. W. Marston	Wooroloo Union Jack (7662)
Doyson's Marigold	do.		1-7-46	1-8-48	150	10.5	3,105	3.99	124.08	W. H. Doyle & Son	Capel Fairy King (9132)
Rosella Melody	Guernsey		12-6-46	7-10-48	120	14.5	2,310	5.16	119.31	Darnell Bros.	Koojan Ace's Roosevelt (7439)
Rutherwood Fairy 2nd	do.	16427	28-2-46	25-8-48	273	6.0	2,408	4.91	118.37	Misses E. & I. Rutherford	Koojan Ace's Sunshade (5942)
Woodford Dairymaid	do.	16749	10-8-46	7-4-48	210	6.0	2,430	4.79	116.46	W. R. Ferry	Brookfields Belief (6820)
Travalgan Lady Eion 35th	Jersey		17-6-46	16-8-48	90	24.0	2,190	5.18	113.55	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Claremont Treasure 54th	A.I.S.		24-6-46	28-8-48	150	14.0	2,880	3.88	112.02	Claremont Hospital for Insane	Capel Monarch (7898)
Tipperary Pearl	do.		27-9-46	3-9-48	180	14.5	3,090	5.38	110.82	K. Prowse	Glanavon Povey (8114)
Woodford Heather	Guernsey	16751	21-7-46	7-6-48	150	10.0	2,490	4.09	101.94	W. R. Ferry	Brookfield's Belief (6820)
Chelsea Jessica	do.		1-5-46	20-6-48	150	6.5	1,755	5.62	98.64	W. D. Patmore	Denmark Briar's Reflection (5745)
Claremont Poppy 45th	A.I.S.		22-1-46	27-4-48	90	25.0	2,490	3.50	87.36	Claremont Hospital for Insane	Westby Monarch (5404)
Rosella Perfume	Guernsey		8-8-46	23-5-48	150	9.0	1,785	4.81	85.86	Darnell Bros.	Koojan Ace's Roosevelt (7439)
Chelsea Rosita	do.		30-4-46	13-8-48	120	5.0	1,665	5.00	83.79	W. D. Patmore	Denmark Briar's Reflection (6745)
Congelin Iolanthe 4th	Jersey		14-8-46	4-7-48	90	17.0	1,770	4.38	77.61	D. Bradford	Grass Vale Twylish Lad (21816)
Wattlehill Margaret	A.I.S.		10-4-47	17-1-49	120	14.0	2,025	3.75	75.99	K. Prowse	Capel Cinderella King (7892)
Durrimba Graceful	Jersey		22-7-46	6-11-48	60	18.5	1,080	6.39	69.00	F. Campbell	Grantham Airman 5th
Rosella Glory	Guernsey		24-5-46	1-3-48	150	8.5	1,275	5.01	63.90	Darnell Bros.	Koojan Ace's Roosevelt (7439)
Juadine Peerless Lily 28th	Jersey		27-10-46	8-12-48	90	6.5	1,035	5.57	57.66	C. E. Jackson	Windrest Star's Aim 2nd (1017)

Woodford Mignonette	Guernsey	16753	21-6-46	17-6-48	30	30.0	900	5.96	53.64	W. R. Ferry	Brookfield's Belief (6820)
Woodford Tiny	do.	16755	19-9-46	30-6-48	120	5.0	1,050	3.80	39.90	do.	do. do. do
Rosella Damsel	do.		6-10-46	1-10-48	90	11.0	1,200	3.23	38.73	Darnell Bros.	Koojan Ace's Roosevelt (7439)
Doyson's Beauty 2nd	A.I.S.		1-4-46	19-6-48	60	13.5	975	3.90	38.10	W. H. Doyle & Son	Wooroloo Noble 4th (6411)
Shepstone Signature	Jersey		1-11-46	20-1-49	60	10.0	720	4.33	31.20	Radford Park Co.	Shepstone Royal Reserve (20155)
Claremont Beanie 17th	A.I.S.	....	14-1-47	16-4-49	30	25.0	750	3.16	23.70	Claremont Hospital for Insane	Wooroloo Night Fighter (8884)
					COWS 2½ YEARS AND UNDER 3 YEARS—STANDARD 250 LB. BUTTER-FAT.						
Carydale Royal Princess	Jersey		26-6-45	3-4-48	273	36.5	9,769	5.43	530.57	G. Layman	Juadine Royal (20841)
Colmyn Jewel	do.		2-9-45	8-7-48	273	18.0	7,644	5.95	454.85	C. H. Ironmonger	Eungella Prince Starbright (19538)
Trelawney Lightly	do.		26-7-45	11-3-48	273	22.0	6,811	5.71	389.18	J. C. Bushell	Greenmount Golden Patch (19603)
Eungella Little Gem	do.		22-5-45	12-5-48	273	14.0	6,627	5.72	379.03	D. G. Spark	Hopelands Marinora's Star (20814)
Koojan Ace's Janet	Guernsey	13494	3-11-44	6-11-47	273	25.0	7,480	5.04	377.40	A. W. Padbury	Homestead Ace (Imp.) (1631)
Eungella Jessamine	Jersey		12-5-45	13-5-48	273	14.0	6,837	5.48	374.97	D. G. Spark	Hopelands Marinora's Star (20814)
Denmark Valencia's Image	Guernsey	12707	17-2-45	23-1-48	273	19.0	5,832	6.36	371.02	Denmark Research Station	Koojan Ideal's Reflection (4974)
Ardersia Snow Queen	Jersey		19-7-45	17-6-48	273	16.0	5,913	6.19	366.22	T. M. Smith	Orphanage Douglas (18919)
Capel Daphne's Pet 2nd	A.I.S.		13-9-45	8-5-48	273	22.0	10,401	3.42	355.79	J. H. Bensted & Co.	Capel Star King (4672)
Claremont Whitby Maid 65th	do.		25-11-45	8-7-48	273	25.5	9,016	3.89	351.49	Claremont Hospital for Insane	Glanavon Dunster (6867)
Eungella Pepita	Jersey		28-6-45	16-5-48	273	12.0	5,796	6.03	349.39	D. G. Spark	Hopelands Marinora's Star (20814)
Narrogin Collette	A.I.S.	.	17-3-45	1-12-47	273	26.0	8,442	4.13	348.84	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Kapara Jolly Handsome 2nd	Jersey		7-7-45	4-5-48	273	10.0	6,060	5.65	342.51	D. Bradford	Congelin Washington (18426)
Carydale Royal Dainty	do.		7-7-45	19-5-48	240	17.0	6,015	5.67	341.25	G. Layman	Juadine Royal (20841)
Kapara Sweet Briar	do.	2205	22-6-45	24-5-48	273	14.0	6,582	5.11	336.26	D. Bradford	Congelin Mandarin (14542)
Drakesbrook Queen Ann	Guernsey	15667	29-8-45	2-7-48	273	19.5	6,793	4.93	334.62	J. R. Giles	Koojan Ace's Aviator (59300)
Mokine Empire's Lily 45th	Jersey		16-8-45	3-6-48	273	20.0	6,090	5.47	332.91	T. H. Wilding	Mokine Reserve (21017)
Travalgan Starbright 30th	do.		8-6-45	31-5-48	273	10.0	5,910	5.57	329.35	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Amaroo Marion	do.	4576	1-5-45	15-4-48	273	13.0	6,129	5.36	328.80	T. O. Abbott	Eungella Golden Starbright (20666)
Wattlehill Patchy	A.I.S.		25-6-45	13-5-48	273	17.0	8,931	3.66	326.98	K. Prowse	Wallatin Ninety Six (7607)
Eungella Miss Marinora	Jersey		15-6-45	11-5-48	273	11.5	5,884	5.50	324.11	D. G. Spark	Hopelands Marinora's Star (20814)
Ardersia Primrose	do.		29-7-45	12-5-48	273	13.5	4,975	6.35	316.07	T. M. Smith	Ardersia Northern King (20338)
River Glen Connie	A.I.S.		10-2-45	18-10-47	273	21.0	7,653	4.07	311.56	M. H. Montgomery	River Glen Admiral 3rd (7353)
Yalebra Roma	Jersey		19-7-45	20-5-48	273	6.5	5,194	5.81	301.65	K. V. Gray	Greenmount Golden Patch (19603)
Grass Vale Design's Magnolia	do.	1678	5-11-44	8-9-47	240	5.0	5,535	5.37	297.75	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
River Glen Vision 2nd	A.I.S.		18-9-45	17-8-48	273	14.5	6,825	4.27	291.67	M. H. Montgomery	River Glen Limelight (3479)
Amaroo Charming Bell	Jersey		7-5-45	22-4-48	273	11.0	5,523	5.10	281.87	T. O. Abbott	Eungella Golden Starbright (20666)
Glanavon Rhona	A.I.S.	50518	26-3-45	14-11-47	273	14.0	5,922	4.71	279.14	D. Bevan & Son	Glanavon Lord (8109)
Travalgan Starbright 32nd	Jersey	.	13-7-45	9-6-48	273	7.0	4,911	5.66	277.85	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Wallatin Violet	A.I.S.		12-7-45	17-6-48	273	18.5	7,765	3.57	276.99	K. Prowse	Capel Cinderella King 2nd (7892)
Grass Vale Nora's Beauty	Jersey		31-7-45	27-7-48	273	5.5	4,681	5.91	276.94	R. H. Rose & Son	Glen Iris Golden Oxford (12694)
Durrimba Temple Belle	do.		24-8-45	3-5-48	273	19.5	4,995	5.51	275.49	F. Campbell	Radyr Park September Lad (14023)
Kiama Primrose 7th	A.I.S.		29-4-45	8-11-47	273	16.0	6,513	4.20	274.09	M. H. Montgomery	Kiama Ronel (7079)
Carydale Royal Lady	Jersey		27-6-45	4-4-48	240	16.5	4,740	5.66	268.71	G. Layman	Juadine Royal (20841)
Parkview Fussy 86th	A.I.S.		17-3-45	25-12-47	240	29.0	6,720	3.93	264.33	D. Bevan & Sons	Parkview Rose's Design (8542)
Burlington Molly	Jersey		25-4-45	11-3-48	273	13.5	5,005	5.28	264.11	Mrs. M. A. Watson	Burlington Sultan (21613)
Chillwell Model's Primrose	do.		24-8-45	26-5-48	273	12.0	4,266	5.99	255.93	do.	Travalgan Leader (958)
Chillwell Julienne's Camelia	do.		27-8-45	27-5-48	273	13.0	4,629	5.49	254.11	do.	do. do.
Claremont Maggie Morrison 74th	A.I.S.		1-1-46	9-7-48	273	19.0	6,822	3.72	253.91	Claremont Hospital for Insane	Westby Masterpiece (5403)
Mayvale Ace's Dahlia	Guernsey	13651	20-12-44	2-11-47	273	10.5	4,806	5.25	252.35	R. J. Giles	Koojan Ace's Dauntless (5933)

TABLE 8—PURE BRED HERD TESTING—*continued.*

Cows which completed test during the twelve months ended 30th June, 1949—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
				COWS 2½ YEARS AND UNDER 3 YEARS—STANDARD 250 LB. BUTTER-FAT—*continued.*							
River Glen Clarabelle 73rd	A.I.S.		2-8-45	16-4-48	273	17.0	6,531	3.86	252.16	M. H. Montgomery	River Glen Sparkler 3rd (5184)
Woodford Chosen	Guernsey	16747	8-11-45	26-9-48	273	6.0	4,113	6.04	248.43	W. R. Ferry	Brookfields Belief (6820)
Lenmoor's Maggie 2nd	A.I.S.	51743	10-9-45	1-8-48	210	8.5	6,045	3.93	237.78	G. W. Marston	Wooroloo Union Jack (7662)
Glanavon Thelma 9th	do.		6-3-45	25-9-47	273	12.0	5,406	4.30	232.48	D. Bevan & Son	Glanavon Fairy's Triumph (8105)
Tipperary Milkmaid	do.	54213	23-11-45	11-9-48	240	9.0	5,640	4.11	231.88	W. G. Burges	Glanavon Povey (8114)
Wooroloo Red Dawn	do.		8-8-45	16-2-48	240	11.0	5,280	4.34	229.41	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Claremont Empress	do.		30-8-45	6-8-48	210	10.0	5,640	4.05	228.32	W. K. Barnes	Capel Monarch (7898)
Chillwell Daffodil Victorious	Jersey		12-8-45	21-7-48	210	14.0	4,590	4.93	226.35	Mrs M. A. Watson	Burlington Sultan (21613)
Kapara Carnation	do.		7-6-45	7-5-48	273	13.0	4,449	5.08	226.03	D. Bradford	Congelin Mandarin (14542)
Kiama Honeycombe 15th	A.I.S.	...	16-4-45	23-11-47	273	15.0	5,652	3.87	219.09	M. H. Montgomery	Liberton Patriot 6th
Claremont Treasure 49th	do.		14-6-45	16-2-48	273	17.0	5,661	3.79	214.73	Claremont Hospital for Insane	Glanavon Dunster (6867)
Glanavon Goldilocks 12th	do.		12-3-45	4-2-48	180	31.0	5,430	3.75	203.76	D. Bevan & Sons	Glanavon Godfrey (8108)
Mereworth Easter Princess 5th	Jersey		15-8-45	18-3-48	240	14.5	3,645	5.22	190.17	B. Langridge	Grantham Easter Marchalong (20736)
Doyson's Pansy	A.I.S.		18-5-45	15-4-48	240	15.5	4,350	4.25	185.07	W. H. Doyle & Son	Windhill General (8857)
Doyson's Tiny	do.		18-5-45	25-1-48	273	7.0	4,521	3.88	176.40	do. do.	do. do.
Mayvale Jewel	Guernsey	16052	27-5-46	18-12-48	180	13.5	4,350	4.05	176.22	R. J. Giles	Koojan Ace's Dauntless (5933)
Kapara Sparkles Lassie 4th	Jersey		12-7-45	31-5-48	150	20.0	3,570	4.89	175.71	D. Bradford	Congelin Washington (18426)
Rosalind Joan	A.I.S.		14-12-45	6-7-48	210	7.0	5,025	3.48	175.32	W. K. Barnes	Wattle Creek Prince Pantheon (8835)
Mereworth Wonderful Nancy	Jersey		29-8-45	5-3-48	273	9.0	3,477	5.00	174.04	B. Langridge	Juadine Volunteer (20842)
Lenmoor's Roma 2nd	A.I.S.		11-10-45	30-4-48	180	10.0	4,470	3.77	168.36	W. K. Barnes	Wooroloo Union Jack (7662)
Glanavon Rosette 8th	do.		24-7-45	6-3-48	150	24.0	3,840	4.27	163.98	D. Bevan & Sons	Glanavon Fairy's Triumph (8105)
Narrogin Mary	do.	52495	31-3-45	29-2-48	273	9.0	4,302	3.72	160.27	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Glanavon Ettie 10th	do.	50502	21-6-45	24-5-48	90	37.0	3,690	4.11	151.74	D. Bevan & Son	Glanavon Fairy's Triumph (8105)
Narrogin Mignon	do.	52496	21-4-45	4-3-48	180	13.0	3,870	3.81	147.45	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Narrogin Astrid	do.	52477	2-6-45	28-2-48	150	11.0	4,050	3.37	136.74	do. do.	Wooroloo Gay Gordon (8878)
Glanavon Daphne 11th	do.		26-8-45	26-5-48	90	32.0	3,300	3.18	125.76	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Narrogin Marlene	do.	52494	7-4-45	13-2-48	180	15.0	3,120	3.91	121.98	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Kapara Iolanthe 3rd	Jersey		7-7-45	11-4-48	90	21.0	2,220	5.12	113.88	D. Bradford	Congelin Mandarin (14542)
Juadine March Flower 4th	do.		16-10-45	26-9-48	90	11.0	2,550	4.08	104.16	C. E. Jackson	Juadine Volunteer (20842)
Kapara Rosebud 3rd	do.		2-8-45	25-5-48	120	8.0	1,890	5.40	102.18	D. Bradford	Grassvale Twylish Lad (21816)
Koojan Ace's Secret	Guernsey	15880	14-10-45	21-7-48	90	23.5	1,875	5.03	94.29	R. J. Giles	Homestead Ace (Imp.) (1631)
Narrogin Dolores	A.I.S.	52486	12-5-45	11-3-48	120	16.0	2,280	3.88	88.62	Narrogin School of Agriculture	Wooroloo Gay Gordon (8878)
Glanavon Esmeralda 5th	do.	..	11-9-45	29-5-48	60	34.0	2,100	3.97	83.49	D. Bevan & Sons	Glanavon Lord (8109)
Kapara Happy Days 3rd	Jersey	...	9-7-45	14-6-48	60	26.0	1,680	4.80	80.70	D. Bradford	Congelin Mandarin (14542)
Doyson's Fairy	A.I.S.	...	20-8-45	7-4-48	120	9.0	1,635	4.57	74.76	W. H. Doyle & Son	Windhill General (8857)

Claremont Cleggett 32nd	A.I.S.	...	14-6-46	18-2-49	90	16.5	1,680	3.70	62.16	Claremont Hospital for Insane	Capel Monarch (6898)
Glanavon Spangle 4th ..	do.	..	13-8-45	24-7-48	30	37.0	1,110	4 52	50.22	D. Bevan & Sons ...	Glanavon Fairy's Triumph (810 5)
Claremont Whitby Maid 66th	do.		27-8-46	9-3-49	60	17.5	1,230	3.49	42 99	Claremont Hospital for Insane	Westby Masterpiece (5403)
Mereworth Easter Princess 7th	Jersey	.	15-7-46	8-3-49	30	22.0	660	4 80	31.68	B. Langridge ...	Grantham Easter Marchalong(20736)
COWS 3 YEARS AND UNDER 3½ YEARS STANDARD 270 LB. BUTTER-FAT.—											
Carydale Royal Queen .	Jersey		25-3-45	3-5-48	273	30 5	10,261	5.75	590 29	G. Layman . .	Juadine Royal (20841)
Denmark Aristocrat's Valencia	Guernsey	12674	1-6-45	17-6-48	273	24 0	9,462	5 14	486.70	Denmark Research Station	Denmark Ace's Aristocrat (5740)
Muresk Lady Ideal .	do.	13940	12-2-45	17-8-48	273	22 0	8,406	5 35	449.93	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Muresk Dora ...	do.	13928	26-8-44	29-1-48	273	30.0	9,032	4 88	441.61	do. do.	Koojan Ace's Warspite (5943)
Eungella Crystal Lily	Jersey		4-4-45	6-8-48	273	13 5	7,300	5 78	422.28	D. G. Spark	Hopeland Marinora's Star (20814)
Ardersia Wyandotte's Pride	do.	.	17-4-45	8-5-48	273	18 0	6,354	6 52	414.41	T. M. Smith	Orphanage Cuba (17913)
Travalgan Lady Elon 27th	do.		29-4-45	11-7-48	273	14 0	7,002	5 87	411 06	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Korilya Andrea	Guernsey	13518	14-6-45	28-9-48	273	25 5	8,101	4 99	404 61	J. R. Giles	Koojan Beau Ideal (4965)
Montaro Princess	A.I.S.	52256	30-6-44	20-11-47	273	28 0	10,074	3 96	399 70	M. H. Montgomery	Glanavon Tudor (8123)
Grass Vale Lady Fowler 46th	Jersey		15-5-45	16-8-48	273	17.0	6,621	5 89	390.42	R. H. Rose & Son	Glen Iris Golden Oxford (12694)
Koojan Ace's Jennie	Guernsey	13495	3-11-44	29-12-47	273	25.0	7,575	5 08	385 28	A. W. Padbury	Homestead Ace (Imp.) (1631)
Ardersia Starlight Lady	Jersey		6-7-45	10-8-48	273	12 5	5,767	6 62	381 91	T. M. Smith .	Orphanage Cuba (17913)
Wattlehill Cinderella .	A.I.S.		12-4-45	18-8-48	273	12 0	10,896	3 48	379 60	K. Prowse	Capel Cinderella King 2nd (7892)
Grass Vale Silvermine 4th	Jersey	1689	29-9-44	28-10-47	240	9 5	6,750	5 61	379 20	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Tipperary Beauty 21st	A.I.S.	54202	1-10-44	16-10-47	273	19.0	7,392	5 06	374 07	M H. Montgomery	Liberton Venturer 2nd (7132)
Carydale Royal Primrose	Jersey		24-3-45	5-6-48	240	18 0	6,525	5 69	371 25	G. Layman	Juadine Royal (20841)
Eungella Marlene	do.		1-4-45	30-6-48	273	12 0	7,635	4 86	371 09	D. G. Spark .	Hopeland Marinora's Star (20814)
Walgett Easter Tulip	do.		8-4-45	10-5-48	273	18 0	7,269	5 05	366 14	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Wooroloo Heatherbell 3rd	A.I S.	48110	5-10-44	26-2-48	273	16 0	7,728	4 67	360 95	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Muresk Fay .	Guernsey	13929	20-5-45	22-7-48	273	12 0	7,056	5 02	354 03	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Casterton Bonnie Lady	do.	12588	19-7-44	8-12-47	273	25 0	7.320	4 81	352 68	J. R. Giles	Casterton Sunshine (5702)
Wattlehill May Day	A.I.S.		1-5-45	31-5-48	273	29 0	10,362	3 30	342 50	K. Prowse	Wallatin Ninety-six (7607)
Grass Vale Buttercup 18th	Jersey	1677	5-11-44	20-4-48	240	18 0	6,615	5 17	341.93	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Muresk Dignity	Guernsey	13925	17-9-44	22-11-47	273	20 0	6,960	4 89	340.30	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Walgett Tuberose	Jersey		17-4-45	24-5-48	273	16 5	5,824	5 81	338 38	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Travalgan Lady Elon 29th	do.		19-5-45	8-10-48	273	10 0	5,160	6 53	337 12	W. H. & T. F. Robinson	Mornmoot Laver (17792)
Juadine Peerless Lily 27th	do		15-5-45	17-10-48	273	12 0	5,361	6 01	328 96	B. Langridge	Juadine Northwood Beau (19670)
Rosella Twilight	Guernsey	14412	5-6-45	25-7-48	210	14 5	6,165	5 18	319 43	Darnell Bros.	Cranbourne Charlie (3993)
Denmark Standard's Dawn	do	12704	28-9-44	24-3-48	273	15 0	5,445	5 85	318 33	Denmark Research Station	Denmark Valencia's Standard (5767)
Mayvale Ace's Buttercup	do.	13649	3-9-44	6-3-48	273	19 5	5,428	5.86	318 08	R. J. Giles	Koojan Ace's Dauntless (5933)
Muresk Adeline	do.	13919	7-9-44	8-12-47	273	20 0	7,230	4.33	317.91	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Chillwell Zena's Daphne	Jersey		1-8-45	19-9-48	273	8.0	5,304	5 97	316 63	Mrs. M. A. Watson	Travalgan Leader (958)
Montaro Empress	A.I.S.	52251	18-2-45	14-5-48	273	15 5	7,081	4.29	303 64	J. H. Bensted & Co.	Glanavon Tudor (8123)
Wooroloo Violet	do.	54754	12-5-45	25-8-48	240	9.0	7,290	4.16	303 36	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Wooroloo Wynette 3rd	do.		15-9-44	29-2-48	273	19.0	6,747	4 47	302.09	do. do.	Glanavon Fusilier (8106)
Wooroloo Golden Dawn 2nd	do.	54723	10-3-45	19-4-48	273	18 0	7,134	4 20	299.88	do. do.	Wooroloo Red Baron (6412)
Claremont Treasure 47th	do.	49660	8-6-45	19-9-48	273	24.5	7,888	3 63	286.34	Claremont Hospital for Insane	Westby Monarch (5404)

TABLE 8—PURE BRED HERD TESTING—*continued.*

Cows which completed test during the twelve months ended 30th June, 1949—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 3 YEARS AND UNDER 3½ YEARS—STANDARD 270 LB. BUTTER-FAT—*continued.*											
Clovelly Golden Pearl	Guernsey	12607	20-5-44	16-10-47	240	10 5	4,800	5.84	280 56	J. R. Cabassi	Lansdowne Polydymite (4955)
Rosella Poppy	do.	14405	14-1-45	14-5-48	273	12 0	5,211	5 37	279 96	Darnell Bros.	Cranbourne Charlie (3993)
Tipperary Beauty 20th	A.I.S.	54201	3-8-44	20-11-47	273	16.0	6,738	4 14	279 40	M. H. Montgomery	Liberton Venturer 2nd (7132)
Kapara Peerless Lily	Jersey		31-3-45	4-5-48	273	14 0	5,592	4 98	278 61	D. Bradford	Congelin Mandarin (14542)
Murra Murra Silver Lady	do.		21-4-45	31-5-48	240	8 5	5,550	4.98	276 42	Mrs. M. A. Crute	The Wolds Northwood King (19138)
Radyr Park Dorothy 32nd	do.		1-5-45	15-9-48	273	7 0	5,046	5.32	268 33	L. M. Temple	Radyr Park Estrellita 2nd's Starlight (21187)
Radyr Park Dorothy 26th	do.		11-6-44	9-10-47	273	5 0	4,965	5 38	267.19	do. do.	do. do. do.
Walgett Golden Dawn	do.		8-4-45	12-5-48	273	9 5	4,678	5.60	261.89	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Claremont Cherry 44th	A.I.S.	49601	4-5-45	19-9-48	273	15 5	6,796	3 85	261 87	Claremont Hospital for Insane	Westby Monarch (5404)
Tipperary Lovely 10th	do.	54210	18-11-44	4-2-48	273	7 0	6,666	3 88	258 99	W. G. Burges	Liberton Venturer 2nd (7132)
Denmark Rosemary 2nd	Guernsey	12702	14-10-44	24-12-47	180	22 0	3,885	6 63	257.43	Denmark Research Station	Koojan Ideal's Reflection (4974)
Clovelly Rougette	do.	12618	18-5-45	12-6-48	273	9 0	4,557	5 58	254 44	J. Cabassi	Denmark Rosa's Ace (5760)
Korijekup Lilian	Jersey		3-6-45	27-8-48	210	10 0	3,930	6 46	254 04	A. G. Eckersley	Navua Royal Star (15869)
Wattlehill Grace	A.I.S.		21-4-45	29-5-48	273	16.5	6,739	3 77	253 91	K. Prowse	Capel Cinderella King 2nd (7892)
Claremont Poppy 43rd	do.	49650	3-6-45	26-8-48	273	15.0	6,255	3 99	249 78	Wooroloo Sanatorium Farm	Glanavon Dunster (6867)
Glanavon Dahlia 24th	do.		4-8-44	5-10-47	273	18 0	6,264	3 97	249 10	D Bevan & Sons	Glanavon Lord (8109)
Rutherwood Annette	Guernsey	14481	15-4-45	13-9-48	273	10 5	4,171	5 90	246 13	Misses E. & T. Rutherford	Koojan Ace's Sunshade (5942)
Mayvale Ideal's Daisy	do.	13665	29-7-44	25-10-47	273	15 5	5,551	4 33	240·87	R. J. Giles	Koojan Ideal's Discoverer (4968)
Montaro Kitty	A.I.S.	52254	19-9-44	10-11-47	273	7 0	5,181	4 59	237.84	M. H. Montgomery	Glanavon Tudor (8123)
Glanavon Nancy 10th	do.		21-8-44	17-1-48	210	34 0	6,000	3 90	233 98	D. Bevan & Sons	Glanavon Fairy's Triumph (8105)
Radyr Park October Star 3rd	Jersey		23-7-45	16-9-48	273	4.0	5,452	4 19	228 65	L. M. Temple	Radyr Park Estrellita 2nd's Starlight (21187)
Amaroo Helena	do.		1-4-45	25-4-48	240	6 0	4,635	4 76	220 77	T. O. Abbott	Eungella Golden Starbright (20666)
Radyr Park Estrella	do.		23-6-45	14-9-48	273	8 0	4,254	5.14	218 72	L. M. Temple	Radyr Park Estrellita 2nd's Starlight (21187)
Doyson's Duchess	A.I.S.		21-4-45	2-7-48	180	22 5	4,765	4 47	212 85	W. H. Doyle & Son	Windhill General (8857)
Glanavon Tiny 13th	do.	50523	1-1-45	21-3-48	150	40 0	5,640	3.75	212.10	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Yalebra Lady	Jersey		15-8-45	25-8-48	273	7 0	4,296	4.93	212 09	K. V. Gray	Mokine Reserve (21017)
Glanavon Dahlia 25th	A.I.S.		5-9-44	12-10-47	273	5 0	4 665	4 33	202.39	D. Bevan & Sons	Glanavon Fairy's Triumph (8105)
Juadine Queen 3rd	Jersey		27-1-45	15-2-48	273	7 0	3,225	6 20	200 07	K. V. Gray	Juadine Volunteer (20842)
Grantham Air Lady 12th	do.		6-3-45	23-6-48	180	18 0	3,735	5 35	199.77	A. Tomerini	Rosecliffe Marchalong (15094)
Radford Park Daisy	do.		28-5-45	23-6-48	210	4 0	3 450	5 39	185.94	Radford Park Co.	Grass Vale Golden Lad (19599)
Doyson's Model	A.I.S.		22-4-45	10-8-48	150	18 0	4,065	4 28	174 00	W. H. Doyle & Son	Windhill General (8857)
Burlington Sweet Wonder	Jersey		21-8-44	27-1-48	273	11 5	3,214	5 38	173.09	Davies & Son	Lawrenny Johnnie (16670)
Doyson's Beauty	A.I.S.		8-4-45	3-7-48	180	13 0	3,930	4 15	163 02	W. H Doyle & Son	Windhill General (8857)
Travalgan Starbright 28th	Jersey		16-4-45	18-6-48	90	26 0	2,880	4.92	141 84	W. H. & T. F. Robinson	Mornmoot Laver (17792)

Claremont Cleggett 30th	A.I.S.		31-6-45	15-12-48	150	12.0	3,260	4.05	132.18	Wooroloo Sanatorium Farm	Westby Masterpiece (5403)
Narrogin Dixie	do.	52485	10-1-45	23-2-48	150	10 0	3,060	3.90	119.34	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Wooroloo Claret . .	do.	54716	3-5-45	25-8-48	90	29 0	2,700	4.33	117.06	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Kiama Bess 20th .	do.	51534	11-4-45	19-4-48	150	14 0	2,880	3 96	114 12	M. H. Montgomery	Kiama Ronel (7079)
Grantham Easter Rye 16th	Jersey		16-6-45	6-9-48	120	17 5	2,625	4 16	109 20	A. Tomerini	Rosecliffe Marchalong (15094)
Wooroloo Stella .	A.I.S.	54749	30-9-45	6-12-48	120	9 0	2,340	4 05	94 80	Wooroloo Sanatorium Farm	Glanavon Fusilier (8106)
Radyr Park Dorothy 34th	Jersey		21-6-45	17-9-48	60	28 0	1,980	4 76	94.26	L. M. Temple .	Radyr Park Estrellita 2nd's Starlight (21187)
Claremont Maggie 25th	A.I.S.		9-8-45	6-10-48	60	28 5	1,935	3 73	72 20	Claremont Hospital for Insane	Westby Monarch (5404)
Wooroloo Iris	do.	54727	23-6-45	22-9-48	30	27.0	810	4 59	37 20	Wooroloo Sanatorium Farm	Glanavon Fusilier (8106)

COWS 3½ YEARS AND UNDER 4 YEARS—STANDARD 290 LBS. BUTTER-FAT.

Denmark Ace's Velvet	Guernsey	12672	3-9 44	3 7-48	273	21 0	11,443	6 54	748 93	Denmark Research Station	Denmark Ace (5738)
Grass Vale Buttercup 17th	Jersey		1-10-44	8 5-48	273	23 0	10,359	5.47	566 71	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Denmark Ace's Dawn 3rd ..	Guernsey	12671	22-10-44	12-7 48	240	12.0	8,445	5 39	455 52	Denmark Research Station	Denmark Ace (5738)
Koojan Ace's Julianna	do.	13500	20-2-44	9 10-47	273	20 0	7,740	5 52	427 85	A. W. Padbury	Homestead Ace (Imp.) (1631)
Grassvale Northwood Maggie	Jersey	1686	13 10-44	10-8-48	273	11 5	7 535	5 17	390 30	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Muresk Diadem	Guernsey	13924	7 5-44	2-2 48	273	24 0	7,032	5.54	389 96	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Juadine Peerless Lily 25th	Jersey		12-12-44	17 9 48	273	13 0	6,609	5 87	387 96	C. E. Jackson	Juadine Northwood Beau (19670)
Grass Vale Silvermine 3rd	do.	1688	15-10-43	28-9 47	240	12 5	6,795	5 56	378 18	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Tipperary Beauty 22nd	A I S.	54203	19-12-44	29 6-48	273	23 0	9,504	3 97	377 75	W. G. Burges	Liberton Venturer 2nd (7132)
Tipperary Lovely 9th	do.		15 11-44	22-7-48	273	10 0	8 910	3 97	354 38	W. G. Burges	do. do. do.
Kapara Rosebud 2nd	Jersey	2201	28-5-44	5-5-48	273	8 0	5 869	6 01	352 40	W. L. Bradford	Congelin Jolly Eminent 3rd (18420)
Muresk Waaf	Guernsey	13951	17-4-44	26 11 47	273	18 0	7,194	4 81	346 46	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Claremont Bell 44th	A.I S.	49576	3-1-45	11-9 48	273	18 5	7,930	4.23	335 55	Claremont Hospital for Insane	Glanavon Dunster (6867)
Chillwell Zena's Buttercup	Jersey		14-8 44	8-3 48	273	19 0	6,117	5 48	335 05	Mrs. M A Watson	Grass Vale Noramine's Beau (19600)
Kapara Duchess 2nd	do	2199	18-6-44	31-5-48	240	15 5	6,255	5 09	318 76	W L. Bradford	Congelin Jolly Eminent 3rd (18425)
Wooroloo Shirley 2nd	A.I.S.	54747	22 10-44	28-4-48	273	19 0	7,737	4 12	318 56	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Mayvale Ideal's June	Guernsey	13667	8-7-44	12-2-48	273	22 5	6,426	4 88	313 84	R J. Giles	Kooian Ideal's Discoverer (4968)
Grass Vale Golden Cream 27th	Jersey	1680	26-9-44	25-4-48	240	9 5	6,765	4 62	312 66	R H. Rose & Son	Mornmoot Northwood Beau (17798)
Chillwell Godetia Gwen	do	.	19-12 44	21-8-48	273	18 5	6,229	4 98	310 26	Mrs. M. A. Watson	Grass Vale Noramine's Beau (19600)
Walgett Handsome Girl 37th	do.		18-4-44	11-4-48	273	16 5	5,539	5 59	309 49	C. J. Cunningham	Selsey Wyandottes Prince (18058)
Claremont Star 36th ...	A.I.S.	49652	26-12-44	28-9-48	273	24 5	8,398	3.68	308 96	Claremont Hospital for Insane	Westby Masterpiece (5403)
Mayvale Ace's Dahlia	Guernsey	13651	20-12-44	27-9-48	240	10 5	4,935	6 24	308 08	R J. Giles	Koojan Ace's Dauntless (5933)
Clovelly Blossom 2nd	do.	12599	4-8 44	6-6-48	240	12 5	5,370	5 64	303.03	J. Cabassi	Denmark Rosa's Ace (5760)
Claremont Treasure 44th	A I.S.	49658	21-2 44	13 11-47	273	26 0	7.683	3 80	292 63	Claremont Hospital for Insane	Summerlea Churchill (6236)
Kapara Firefly 2nd	Jersey	2200	5-8-44	5-6-48	240	13 5	6,375	4 58	288 75	W. L. Bradford	Congelin Mandarin (14542)
Chillwell Models Mignonette	do.	..	5-8-44	4 8-48	240	13 0	5,265	5 33	280 65	Mrs. M. A. Watson	Grass Vale Noramines Beau (19600)
Amaroo Winsome . ..	do.		22-7-44	19-4-48	273	8 5	4,585	6 01	275.60	T. O. Abbott	Greenmount Starbright (20748)

TABLE 8—PURE BRED HERD TESTING—*continued.*

Cows which completed test during the twelve months ended 30th June, 1949—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 3½ YEARS AND UNDER 4 YEARS—STANDARD 290 LB. BUTTER-FAT.											
Rosella Gloria ..	Guernsey	14395	2-11-44	24-7-48	210	13·0	5,145	5·16	265·83	Darnell Bros. .	Cranbourne Charlie (3993)
Davyhurst Sally	A.I.S.	.	10-10-44	19-6-48	210	13·0	6,615	3·96	261·91	W. H. Doyle & Son	Tipperary President (5335)
Kapara Sparkles' Lassie 3rd	Jersey	2203	13-8-44	4-6-48	240	10·5	5,820	4·46	259·74	W. L. Bradford ...	Congelin Jolly Eminent 3rd (18425)
Mereworth Dreaming Fondant	do.	..	31-5-44	16-5-48	273	8·5	5,050	5·12	258·59	B. Langridge	Navua Coronation Star (14929)
Rosalind Janet 9th	A.I.S.	53323	23-10-44	26-8-48	273	5·0	5,595	4·39	245·59	W. K. Barnes ..	Wallatin Dandy (6370)
Mereworth Oxford Princess 3rd	Jersey	..	7-8-44	3-5-48	273	13·0	4,184	5·77	241·66	B. Langridge ..	Navua Coronation Star (14929)
Chillwell Juliennes Lily ...	do.	..	2-9-44	8-4-48	273	12·0	4,536	5·31	240·81	Mrs. M. A. Watson ..	Juadine Northwood Beau (19670)
Davyhurst Lilac	A.I.S.	.	20-9-44	12-4-48	240	12·0	6,510	3·67	239·52	W. H. Doyle & Son ..	Tipperary President (5335)
Mayvale Ace's Butterfly .	Guernsey	13650	22-7-44	5-2-48	273	13·0	5,304	4·42	234·45	R. J. Giles ...	Koojan Ace's Dauntless (5933)
Rosella Matilda	do.	14400	23-9-44	15-6-48	240	7·5	3,945	5·73	226·14	Darnell Bros.	Cranbourne Charlie (3993)
Chelsea Anna 2nd	do.	12590	23-10-44	12-8-48	210	9·0	4,425	4·93	218·52	W. D. Patmore .	Denmark Briar's Reflection (5745)
Rosalind Janet 8th	A.I.S.	.....	15-10-44	6-8-48	240	7·0	4,935	3·73	184·47	W. K. Barnes .	Wallatin Dandy (6370)
Alne Bank Fairy 36th ...	do.	48446	9-12-44	9-8-48	210	9·5	5,140	3·33	171·00	G. W. Marston .	Park View Factor (5107)
Juadine Peerless Lily 24th ..	Jersey	...	18-5-44	10-3-48	120	6·5	2,010	4·95	99·66	K. V. Gray ..	Juadine Northwood Beau (19670)
Narrogin Damsel	A.I.S.	52481	7-6-44	11-2-48	120	10·0	2,370	3·63	86·16	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Chelsea Queenie	Guernsey	12595	27-3-45	21-10-48	60	18·0	1,275	4·67	59·58	W. D. Patmore ..	Denmark Briar's Reflection (5745)
Mereworth Bravo Silvermine	Jersey	....	25-6-45	6-3-49	30	19·0	570	5·77	32·88	B. Langridge ..	Grantham Easter's Marchalong (20736)
COWS 4 YEARS AND UNDER 4½ YEARS—STANDARD 310 LB. BUTTER-FAT.											
Merrivale Anne	Guernsey	13634	1-1-44	22-5-48	273	16·0	9,108	6·56	598·14	W. J. Smith . .	Denmark Ace's Image (5741)
River Glen Clarabelle 67th . .	A.I.S.	46299	17-4-44	19-8-48	273	27·5	11,184	4·35	487·27	M. H. Montgomery .	Kiama Chief (4098)
Muresk Veronica .	Guernsey	13950	3-7-44	21-8-48	273	23·0	8,439	5·33	449·46	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Valliere Dairymaid	A.I.S.	47673	8-4-44	6-4-48	273	25·5	11,206	3·96	443·96	J. H. Bensted & Co. ..	Valliere Skipton (7595)
Muresk Awas	Guernsey	13921	25-5-44	2-8-48	273	16·0	9,768	4·44	433·88	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Juadine Jewel 5th	Jersey	.	29-1-45	2-4-48	273	22·5	8,317	5·17	430·37	G. Layman . .	Juadine Northwood Beau (19670)
Carydale Royal Daisy	do.	758	4-3-44	22-4-48	273	17·0	6,996	5·99	419·05	G. Layman . .	Juadine Royal (20841)
Grass Vale Lady Fowler 39th	do.	1681	30-9-43	23-10-47	273	17·0	7,896	5·11	404·25	R. H. Rose & Son .	Mornmoot Northwood Beau (17798)
Muresk Joan .	Guernsey	13936	10-6-44	6-10-48	273	20·0	8,400	4·45	373·84	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Wooroloo Model 2nd	A.I.S.	48122	26-6-44	16-9-48	273	16·0	9,018	4·01	362·00	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Carydale Centenary Girl	Jersey	755	12-3-44	2-5-48	273	19·0	6,507	5·38	350·21	G. Layman .	Carydale Bidomak (20529)
Walgett Fondant ...	do.	...	2-4-44	15-4-48	273	15·5	6,986	4·74	331·30	C. J Cunningham .	Selsey Wyandotte's Prince (18058)
Radyr Park Dorothy 29th .	do.	....	12-7-44	20-9-48	273	7·0	6,111	5·11	312·27	L. M. Temple . .	Radyr Park Estrellita 2nd's Starlight (21187)
Camden Charmaine	do.	...	11-7-43	16-12-47	273	6·0	5,358	5·74	307·70	A. G. Eckersley ...	Greenmount Golden Bobbie (18578)
Wooroloo Bertha	A.I.S.	48091	26-7-44	25-9-48	273	11·0	7,443	4·11	306·24	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Koojan Ace's Jane	Guernsey	13493	5-7-44	3-8-48	273	13·0	5,544	5·51	305·74	A. W. Padbury	Homestead Ace (Imp.) (1631)

Kapara Sparkle 4th	Jersey	2202	15-4-44	1-7-48	273	10·5	6,451	4·68	302·53	W. L. Bradford	Congelin Jolly Eminent 3rd (18425)
Clovelly Twinkle	Guernsey	12620	30-4-44	11-6-48	273	7 0	5,496	5·42	298·12	J. Cabassi	Lansdowne Polydymite (4995)
Rutherwood Golden Dawn ..	do.	14488	15-4-44	13-9-48	273	13·5	5,815	4 96	288·70	Misses E. & I. Rutherford	Denmark Golden Rippler (5751)
Mereworth Coronation Vanilla	Jersey	..	22-3-44	28-5-48	273	10 0	5,355	5 33	285·71	B. Langridge	Navua Coronation Star (14929)
Rutherwood Golden Beauty	Guernsey	14486	28-12-43	8-4-48	273	14 5	5,248	5 42	284 55	Misses E. & I. Rutherford	Denmark Golden Rippler (5751)
Claremont Clarie 4th .	A.I.S.	49608	3-2-44	5-8-48	273	14 0	7,212	3 90	281 29	Wooroloo Sanatorium Farm	Summerlea Churchill (6238)
Denmark Dulceena	Guernsey	12680	6-1-44	15-3-48	273	8·0	4,839	5 63	272 64	W D. Patmore	Koojan Ideal's Reflection (4974)
Eungella Yileen ..	Jersey	1354	27-4-44	10-5-48	273	6·0	5,058	5 33	269 83	D G Spark	Eungella Prince Starbright (19538)
Claremont Poppy 34th .	A I S.	49646	22-2-44	6-8-48	273	4 5	6,463	4 17	269 59	Claremont Hospital for Insane	Summlea Churchill (6238)
Kapara Valentine	Jersey	2206	13-3-44	4-4-48	273	16 5	5,719	4 67	267·13	W. L. Bradford	Kapara Cream Sox (20860)
Grass Vale Lady Fowler 41st	do.	..	3-4-44	24-8-48	273	9 5	5,338	4·96	264 79	K. V. Gray .	Mornmoot Northwood Beau (17798)
Radford Park Lily	do.	..	21-5-44	13-8-48	210	4 0	4,260	6·07	258 51	Radford Park Co.	Grass Vale Golden Lad (19599)
Glanavon Picture 8th ..	A.I.S.	.	8-7-43	22-9-47	273	18 0	6,564	3 92	257 89	D. Bevan & Sons .	Blacklands Monarch's Commander (1877)
Lenmoor's Rosy	do.	45032	18-8-43	2-11-47	240	15 0	6,030	4 12	248 97	W. K Barnes	Ferndale Radiant (5729)
Kapara Dairymaid 3rd .	Jersey	2198	4-8-44	27-8-48	273	10·0	5,100	4·83	246 39	W. L. Bradford .	Congelin Mandarin (14542)
Lenmoor's Queen 5th .	A.I S.	51745	20-6-44	16-7-48	240	5·0	7,230	3 36	242·99	G. W. Marston .	Wooroloo Union Jack (7662)
Radyr Park Estrellita 5th ...	Jersey	3479	1-8-43	19-9-47	273	8·0	3,924	6 14	241 07	L. M. Temple	Navua September Lad (14023)
Rutherwood Golden Twinkle	Guernsey	14494	4-1-44	3-5-48	273	5 0	5,280	4 46	235 30	Misses E. & I. Rutherford	Denmark Golden Rippler (5751)
Wooroloo Delys . . .	A.I.S.	48097	1-4-44	3-7-48	210	7 0	5,460	4 26	232·86	Wooroloo Sanatorium Farm	Wooroloo Top Gallant (7661)
Rosella Daffodil .	Guernsey	14302	7-8-44	15-8-48	180	13·5	3,993	5 14	230 64	Darnell Bros	Cranbourne Charlie (3993)
Lenmoor's Della 5th .	A.I.S.	51740	14-8-44	5-11-48	210	3 0	4,845	4 68	227 04	G. W Marston	Ferndale Radiant (5729)
Clovelly Diana .	Guernsey	12603	15-5-44	6-7-48	240	9 5	5,175	4 21	218 00	J. Cabassi	Lansdowne Polydymite (4995)
Radford Park Pansy	Jersey		22-5-44	13-8-48	210	4 0	4,500	4 83	217·38	Radford Park Co	Grass Vale Golden Lad (19599)
Rutherwood Golden Twilight	Guernsey	14492	4-1-44	3-5-48	273	9·0	4,692	4 58	214·78	Misses E. & I. Rutherford	Denmark Golden Rippler (5751)
Mereworth Dreaming Silvermine	Jersey	..	31-5-44	29-9-48	240	11 5	4,230	4 87	206 02	B. Langridge	Navua Coronation Star (14929)
Clovelly Golden Pearl .	Guernsey	12607	20-5-44	31-8-48	180	10 5	4 215	4 69	197 97	J. Cabassi	Lansdowne Polydymite (4995)
Valliere Winnie	A.I S.	47716	10-4-44	18-9-48	150	19 5	4,965	3 92	194 46	J. H. Bensted & Co.	Valliere Skipton (7595)
Radford Park Rose .	Jersey		17-5-44	23-8-48	210	4 0	2,895	6 42	185 79	Radford Park Co.	Grass Vale Golden Lad (19599)
Glanavon Goldilocks 8th ..	A.I.S	.	11-10-43	28-3-48	120	33·5	4,125	3 92	161 91	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Grass Vale Magnolia 6th	Jersey	1684	3-4-44	11-7-48	90	37 0	3,330	4·86	161 73	R H. Rose & Son .	Mornmoot Northwood Beau (17798)
Mayvale Discoverer's Bluebell 3rd	Guernsey	13659	28-7-44	29-10-48	210	6 0	3 660	4 40	161 22	R. J. Giles	Koojan Ideal's Discoverer (4968)
Brookfield's Jess . .	do	12343	15-11-43	17-5-48	210	9 5	2,820	5 56	156 93	W. D. Patmore	Yarraview Julien (4634)
Radford Park Boronia ...	Jersey	.	20-9-44	27-10-48	120	8·0	2,760	5·07	140·01	Radford Park Co. .	Grass Vale Golden Lad (19599)
Glanavon Princess 2nd ...	A.I S.	.	22-12-43	10-4-48	120	31·0	3,780	3 62	137·13	D Bevan & Sons	Newstead Triumph (3420)
Mayvale Ace's Buttercup	Guernsey	13649	3-9-44	15-1-49	120	15·5	3,015	4 37	131 85	R. J. Giles	Koojan Ace's Dauntless (5933)
Juadine Julienne 4th	Jersey		28-5-44	30-6-48	120	5·5	1,445	4·76	68·79	K. V. Gray .	Juadine Northwood Beau (19670)
COWS 4½ YEARS AND UNDER 5 YEARS—STANDARD 330 lb. BUTTERFAT.											
Koojan Noblemark's Bo Peep	Guernsey	13512	19-12-42	17-11-47	273	25 0	9,855	5.76	567 97	A. W. Padbury	Koojan Ideal's Noblemark (5949)
Grass Vale Eve	Jersey	1679	19-9-43	1-9-48	273	19 0	8,802	5 88	517.38	R H. Rose & Son	Mornmoot Northwood Beau (17798)
Grass Vale Golden Cream 26th	do	98525	3-8-43	7-8-48	273	14 0	8,397	6 00	504 57	R. H. Rose & Son	do do. do.
Lenmoor's Red Queen	A.I.S.		18-8-43	5-4-48	273	29 5	12 120	3 93	477 00	G. W. Marston	Ferndale Radiant (5729)
Denmark Bonnie Marie	Guernsey	12675	30-11-43	30-6-48	273	10 0	8,655	5 41	468.50	Denmark Research Station	Denmark Marie's Ruler (5756)
Grass Vale Magnolia 5th	Jersey	98526	16-10-43	9-8-48	273	9 0	7,892	5 82	459 45	R. H. Rose & Son	Grass Vale Gold Cup (20745)
Camden Celeste	do.	97747	10-9-43	6-5-48	273	16.5	7,399	6 03	446 48	D. G. Spark	Greenmount Golden Bobby (18578)

TABLE 8—PURE BRED HERD TESTING—*continued.*

Cows which completed test during the twelve months ended 30th June, 1949—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test lb.	Weight of Milk for Period. lb	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 4½ YEARS AND UNDER 5 YEARS—STANDARD 330 LB. BUTTER-FAT—*continued.*											
Travalgan Starbright 23rd	do.	100462	27-6-43	15-5-48	273	19 0	7,287	6.10	444 76	J. C. Bushell	Orphanage Douglas (18919)
Carydale Precious	do.	757	6-5-43	28-3-48	273	26 0	8,898	4 96	441 83	G. Layman	Hopelands Pattern (18624)
Koojan Ace's Gladsome	Guernsey	13491	24-3-43	16-11-47	273	19 0	8,097	5 45	441.68	A. W. Padbury	Homestead Ace (Imp.) (1631)
Tipperary Dove 23rd	A.I.S.	47489	7-4-43	11-12-47	273	28 0	11,544	3 82	441 56	W. G. Burges	Tipperary Ace (6336)
Trelawney A. B.	Jersey		27-4-43	22-3-48	273	27 0	8,220	5 37	441.25	J. C. Bushell	Greenmount Golden Patch (19603)
Greyleigh Precious Gem 3rd	A.I.S.	50962	29-9-43	14-7-48	273	26 0	10,878	3 95	430 36	W. G. Burges	Greyleigh Wooton (4016)
Korijekup Nadine	Jersey		23-11-43	20-7-48	273	11 0	6,573	6 01	395 31	A. G. Eckersley	Juadine Captain (20840)
Muresk Susanna	Guernsey	13948	29-11-43	25-9-48	273	17.0	7,881	4 93	388.84	Muresk Agricultural College	Koojan's Ideal Dictator (4167)
Eungella Telopia	Jersey	98286	20-5-43	14-5-48	273	9.0	5,982	6 40	383 33	D. G. Spark	Travalgan Starbright King (18129)
Carydale Pretty Janis	do.	97783	20-4-43	3-4-48	273	18 0	7,074	5 27	373 04	G. Layman	Hopelands Pattern (18624)
Juadine Queen 2nd	do.		2-1-44	31-7-48	273	9 0	6,282	5 44	341 57	K. V. Gray	Juadine Northwood Beau (19670)
Denmark Reflection's Dawn	Guernsey	2695	12-11-43	17-5-48	273	13 0	6,309	5 38	339 25	W. D. Patmore	Koojan Ideal's Reflection (4974)
Walgett Ranunculas	Jersey	4112	26-5-43	24-3-48	273	20 5	6 841	4 74	324 10	C J Cunningham	Selsey Wyandottes Prince (18058)
Cloveily Hazel	Guernsey	12608	14-8-43	20-5-48	273	10 0	6 015	5 38	323 50	J. Cabassi	Lansdowne Polydymite (4995)
Tipperary Lady May 6th	A.I.S.	47496	8-5-43	10-3-48	273	13 0	7,719	3 94	304 54	W. G. Burges	Tipperary Ace (6336)
Rosella Ladybird	Guernsey	14398	29-11-43	25-7-48	210	13 5	5 955	4 84	297 60	Darnell Bros.	Cranbourne Charlie (3993)
Clovelly Melba	do.	12613	21-6-43	17-6-48	273	13 0	7,149	4 15	296 49	J. Cabassi	Lansdowne Polydymite (4995)
Claremont Plum 9th	A.I.S.	42647	24-11-42	26-10 47	273	21 0	8,118	3 63	295.15	Claremont Hospital for Insane	Westby Monarch (5404)
Denmark Dawn's Reflectionette	Guernsey	12679	7-9-43	14-7-48	210	14 0	5,460	5 34	291 72	Denmark Research Station	Koojan Ideal's Reflection (4974)
Woodford Dainty	do.	15196	4-9-43	15-5-48	273	10 0	5,190	5 50	285 75	W. R. Ferry	Yarraview Clarinet 2nd (4629)
Lenmoor's Peggy 2nd	A.I.S.	51744	15-1-44	25-8-48	273	4 5	7,303	3 89	284 39	G. W. Marston	Ferndale Radiant (5729)
Wooroloo Golden Dawn	A.I.S.	48107	17-10-43	24-9-48	273	12 0	6,726	4 12	277.45	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Maldon Joan	do.	45225	20-7-43	24-4-48	240	15 0	6,915	3 99	276 10	W. H. Doyle & Son	Capel Great Star (5580)
Glanavon Fairy 8th	do.	43754	24-3-43	5-10-47	273	10 0	6 540	4 10	268 77	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Murra Murra Golden Patch	Jersey		11-12-43	7-8-48	180	13 5	4,935	5 44	268 65	Mrs. M. A. Crute	The Wold Northwood King (19138)
Capel Rose Marie	A.I.S.	42462	12-6-43	8-6-48	180	19 5	6,990	3 79	265 26	W. H. Doyle & Son	Capel Dove King (5579)
Grantville Blossom 5th	do.	44123	26-10-43	3-9-48	150	33 0	6,720	3 77	253 17	W. G. Burges	Swanlea Monarch (7514)
Claremont Pinafore 19th	do.	49643	3-1-44	8-9-48	273	25 0	8,055	3.09	249 21	Claremont Hospital for Insane	Westby Monarch (5404)
Mokine Empire's Lily 41st	Jersey	2865	10-10-43	25-7-48	273	3 5	4,245	5 85	248.32	Davies & Son	Mokine Royal Dick (21018)
Kapara Firefly	do.	98816	11-8-43	7-5-48	210	14 0	5,445	4 56	248 28	W. L. Bradford	Congelin Mandarin (14542)
Tipperary Beauty 17th	A.I.S.	47484	1-4-43	26-11-47	240	8 0	6,640	3 63	241 02	W. G. Burges	Tipperary Ace (6336)
Koojan Ace's Juliette	Guernsey	13501	29-5-44	14-12-48	180	23 5	5,760	4 11	236 97	R. J. Giles	Homestead Ace (Imp.) (1631)
Maldon Ethel	A.I.S.	45221	10-8-43	15-7-48	180	19 5	6,450	3 66	236 55	W. H. Doyle & Son	Capel Great Star (5580)
Clovelly Lola	Guernsey	12612	7-9-43	9-5-48	273	12 5	5,137	4.55	233.80	J. Cabassi	Lansdowne Polydymite (4995)
Glanavon Fairy 9th	A.I.S.		3-5-43	24-4-48	240	38.0	5,790	4 00	231.63	D. Bevan & Son	Blacklands Monarch's Commander (1877)
Maldon Peggy	A.I.S.	45229	21-7-43	8-6-48	210	22.5	6,690	3.30	221.07	W. H. Doyle & Son	Capel Great Star (5580)

Glanavon Daphne 9th	do.	....	1-5-43	24-3-48	150	29.0	5,160	4.04	208.74	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Camden Milkmaid	Jersey	.	9-12-43	20-6-48	240	7.0	4,140	4.96	205.72	K. V. Gray	Greenmount Starbright (20748)
Mereworth Oxford Makanora	do.	. .	28-6-43	15-4-48	240	10 5	4,090	4.91	201.06	B. Langridge .	Clarendon Eyre Oxford Pioneer (11484)
Maldon Betty	A.I.S.	45217	20-7-43	2-7-48	180	12 5	5,595	3.58	200 82	W. H. Doyle & Son .	Capel Great Star (5580)
Mokine Empires Lily 40th .	Jersey	2864	27-9-43	13-8-48	210	5 0	4,155	4 76	198 06	Davies & Sons .	Mokine Royal Dick (21018)
Mayvale Ideal's June ..	Guernsey	13667	8-7-44	8-2-49	120	22 5	3,615	5 17	186 81	R. J. Giles	Koojan Ideal's Discoverer (4968)
Muresk Gwenda	do.	13932	3-5-43	9-3-48	240	8 0	4,005	4 55	182 39	J. R. Giles	Koojan Ideal's Dictator (4167)
Mereworth Oxford Vanilla 3rd	Jersey	99301	30-4-43	16-4-48	240	8 5	3,360	5 23	175 89	B. Langridge	Clarendon Eyre Oxford Pioneer (11484)
Grass Vale Buttercup 14th	do.	98523	7-9-43	7-5-48	90	28 0	3 330	5 12	170 82	R. H. Rose & Son	Grass Vale Gold Cup (20745)
Narrogin Flo	A.I.S.	45649	6-4-43	25-2-48	180	13 0	4,230	3 54	150 00	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Trelawney Belle	Jersey	3969	12-5-43	25-3-48	180	8 0	2,100	6.24	131 16	F. Campbell	Greenmount Golden Patch (19603)
Rosella Pauline .	Guernsey	14403	8-8-43	17-4-48	180	5 5	2,520	4 56	115 11	Darnell Bros.	Cranbourne Charlie (3993)
Travalgan Lady Eion 18th	Jersey	100456	30-5-43	15-4-48	150	10 0	2 010	5 34	107 46	F. Campbell	Orphanage Cuba (17913)
Rosella Bloom .	Guernsey	14391	1-9-43	26-3-48	120	19 0	2,115	4 86	102 93	Darnell Bros.	Cranbourne Charlie (3993)
Juadine Peerless Lily 24th	Jersey		18-5-44	15-1-49	90	6 5	1,755	5 48	96 18	K. V. Gray	Juadine Northwood Beau (19670)
Brookfields Blanche .	Guernsey	12325	2-10-43	23-8-48	60	16 5	1,470	4 08	73.29	W. D. Patmore	Yarraview Julian (4634)
				COWS 5 YEARS OLD AND OVER -STANDARD 350 LB. BUTTERFAT.							
Mokine Beauty	Jersey	94437	20-9-41	21-6-48	273	29 0	11,127	5 94	661.13	T. H. Wilding	Erlwin Royal Volunteer (16491)
Congelin Rose Marie 6th	Jersey	80830	14-4-40	6-5-48	273	26.0	10,068	6.25	629.14	D. Bradford	Rosecliffe Marchalong (15094)
Grass Vale Lady Fowler 33rd	do.	92716	7-7-41	20-4-48	273	33 0	11,574	5 18	601 09	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Grass Vale Silvermine 2nd	do.	1687	8-9-42	22-7-48	273	18 0	10,204	5 37	548 21	do. do.	do. do. do.
Denmark Golden Valencia 2nd	Guernsey	8535	15-9-39	3-7-48	273	18 0	9,639	5 63	542.73	Denmark Research Station	Koojan Ace's Goldseeker (3431)
Marrivale Serene	do.	10855	22-7-42	21-5-48	273	16 5	9.634	5 55	534 75	W. J. Smith	Marrivale Buccaneer (5041)
Eungella Faline	Jersey	98285	4-5-43	24-5-48	273	22 0	9,526	5 61	534 46	D. G. Spark	Travalgan Starbright King (18129)
Denmark Reflectionette	Guernsey	12691	15-11-42	21-11-47	273	24 0	8,787	5 98	525 48	Denmark Research Station	Koojan Ideal's Reflection (4974)
Marrivale Dawn .	Guernsey	8936	1-9-38	27-3-48	273	26 0	7,563	6 59	498 97	W. J. Smith	Moongi Golden Dream (1493)
Wooroloo Netta 2nd	A.I.S.	33996	6-10-39	19-2 48	273	27 0	11,331	4 31	488 37	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Travalgan Starbright 20th	Jersey	100459	15-4-43	21-4 48	273	25 0	7,755	6 18	479 64	J. C. Bushell	Orphanage Cuba (17913)
Colmyn Golden Lustre	do.	80800	5-9-40	7-7-48	273	19.0	9,372	5 03	471 17	C. H. Ironmonger	Clarendon Eyre Golden Oxford (13606)
Marrivale Sylph	Guernsey	10857	3-9-40	4-4-48	273	18 0	7,209	6 53	470 55	W. J. Smith	Koojan Golden Prosper (2283)
Walgett Lady Wyandotte	Jersey	4109	29-4-42	31-7-48	273	15 0	8,790	5 27	463 98	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Glanavon Maggie 2nd	A.I.S.	36563	21-2-41	17-5-48	273	21 0	10,653	4 35	463 65	M. H Montgomery	Blacklands Monarch's Commander (1877)
Denmark Bonnie Princess	Guernsey	12676	28-11-42	16-9-48	273	21 5	8 744	5 27	460 93	Denmark Research Station	Koojan Ideal's Reflection (4974)
Marrivale Sublime .	Guernsey	10856	28-3-41	12-10-47	273	30 5	8,176	5 61	459 07	W. J. Smith	Moongi Golden Dream (1493)
Walgett Royal Lily	Jersey	4113	26-3-42	9-7 48	273	19 0	9,087	5 05	458 95	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Tipperary Lovely 4th	A.I.S.	40644	29-6-40	25-4-48	273	25 0	10,215	4 41	450 81	M. H. Montgomery	Blacklands Monarch's Commander (1877)
Chenaar Mavis	Jersey		6-1-40	13-8-48	273	12 5	9,382	4 74	445 00	C. E. Jackson	Travalgan Starbright's Altitude (12260)
Tipperary Dove 25th	A I S.	47490	6-5-43	17-7-48	273	22 0	11,496	3 86	443 95	W. G. Burges	Tipperary Ace (6336)
Wooroloo Gail . .	A.I.S.	48105	28-2-43	6-7-48	273	10 0	10,230	4.31	440 86	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Tipperary Beauty 11th	A.I.S.	40633	20-9-40	9-8-48	273	19 0	10,417	4 16	433 49	M. H. Montgomery	Liberton Venturer (4988)
Denmark Briar Rose	Guernsey	6959	15-8-37	22-10-47	273	26 0	8,388	5 09	426.81	Denmark Research Station	Denmark Illustrious (3320)

TABLE 8—PURE BRED HERD TESTING—*continued*.

Cows which completed test during the twelve months ended 30th June, 1949—*continued*.

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 5 YEARS OLD AND OVER—STANDARD 350 LB. BUTTER-FAT—*continued*.											
Claremont Treasure 25th	A.I.S.	35571	22-11-40	25-6-48	273	30.0	10,620	3.99	424.12	Wooroloo Sanatorium Farm	Westby Monarch (5404)
Ardersia Lady Catherine	Jersey	70011	31-8-38	6-6-48	273	21 5	8,359	4.94	413 60	T. M. Smith	Glen Iris Golden Oxford (12694)
Clovelly Crystal	Guernsey	10240	31-8-41	13-5-48	273	12.0	8,151	5.05	411 95	J. Cabassi	Koojan Monogram (4174)
Denmark Ace's Rose	do.	10284	29-11-41	17-5-48	273	15·0	8,100	5·03	407·70	Denmark Research Station	Homestead Ace (Imp.) (1631)
Colmyn Golden Melody	Jersey	75709	29-5-39	13-8-48	273	16·5	8,269	4·85	401·30	C. H. Ironmonger	Clarendon Eyre Golden Oxford (13606)
Walgett Joy's Gift	do.	4108	6-4-42	28-3-48	273	30 0	8,430	4·73	399·13	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Radyr Park Dorothy 20th	do.	99940	17-6-42	30-5-48	273	12·0	8,226	4·83	397·37	L. M. Temple	Navua September Lad (14023)
Tirano Beauty	A.I.S.	47502	11-9-41	13-9-48	240	10·0	9,840	3·99	392·91	J. H. Bensted & Co.	Chittering Prince (3800)
Lenmoor's Queen 2nd	do.	37904	24-7-40	2-6-48	273	13·5	10,750	3 63	390·70	G. W. Marston	Lenmoor's Gem (4977)
Denmark Bonnie Mary	Guernsey	6958	30-9-37	3-10-48	273	18·0	7,344	5·24	384·59	Denmark Research Station	Denmark Illustrious (3320)
Eungella Dark Venus	Jersey	92032	18-5-41	29-6-48	273	7 0	7,806	4·88	381 29	D. G. Spark	Travalgan Starbright King (18129)
Murra Murra Easter's Twinklette	do.	88035	5-4-41	13-4-48	273	21·5	7,819	4·84	378·49	Mrs. M. A. Crute	Grantham Easter's Monarch (11656)
Juadine Peggy	do.	93219	16-9-41	10-3-48	273	21·0	7,545	5·00	377 67	J. C. Bushell	Austral Park Wonderful Standard (12423)
Clovelly Lily	Guernsey	10244	25-8-42	4-6-48	273	13 5	6,745	5·56	374·96	J. Cabassi	Lansdowne Polydymite (4995)
Murra Murra Princess Royal	Jersey	83006	3-4-40	12-6-48	240	14·5	7,395	5·07	374·90	Mrs M. A. Crute	Grantham Easter's Monarch (11656)
Walgett Easter Lily	do.	69576	20-4-37	13-4-48	273	18·0	8,109	4·59	372·20	C. J. Cunningham	Walgett Beau's Masterpiece (13349)
Radyr Park September Estrellita	do.	.	22-6-43	15-7-48	273	10 0	6,360	5 85	372·18	L. M. Temple	Navau September Lad (14023)
Lansdowne Bonnie Elizabeth	Guernsey	10706	1-6-42	7-4-48	273	23·0	7,359	5·04	371·19	J. R. Giles	Koojan Beau Ideal (4965)
Clovelly Cherry	do.	10239	24-8-42	6-6-48	273	14·0	7,275	5·11	371·06	J. Cabassi	Koojan Monogram (4174)
Muresk Delicia's Pride	do.	13923	11-6-43	27-9-48	273	12·0	7,866	4·72	370·94	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Walgett Golden Duchess	Jersey	79446	21-5-38	5-4-48	273	24·0	7,662	4·84	370·71	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Walgett Handsome Girl 30th	do.		9-7-42	5-4-48	273	22·5	6,907	5·34	368·84	do. do.	Selsey Wyandotte's Prince (18058)
Lansdowne Ideal's Pride	Guernsey	13533	9-1-43	3-5-48	273	20 5	7,681	4·79	368·67	J. R. Giles	Koojan Beau Ideal (4965)
Grass Vale Topsy	Jersey	86647	11-8-41	2-6-48	273	13 0	7,374	4·98	367·20	K. V. Gray	Mornmoot Northwood Beau (17798)
Coogely Jonquil	Guernsey	6945	1-11-37	8-1-48	273	25·0	6,900	5·32	367·11	Denmark Research Station	Coogely Judy's Goldmine (2621)
Claremont Biddy 60th	A.I.S.	35493	12-1-42	28-1-48	273	25·0	8,585	4 26	366 07	Claremont Hospital for Insane	Westby Monarch (5404)
Denmark Dame 2nd	Guernsey	10289	6-11-41	5-5-48	273	21·0	7,383	4·95	365·43	Denmark Research Station	Denmark Lady's Goldseeker (4799)
Capel Fairy 3rd	A.I.S.	10308	30-4-42	24-8-48	273	11·0	10,308	3 51	362·60	K. I. Prowse	Capel Lottie's Reward (3782)
Walgett Melanie	Jersey	4110	10-4-41	3-6-48	273	11·5	6,334	5·70	361·00	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Walgett Handsome Girl 29th	do.	..	24-6-42	29-3-48	273	17·5	5,722	6 29	359 48	do. do.	do. do. do.
Colmyn Empress	do.	97884	9-9-42	14-8-48	273	8·0	7,059	5·09	359·05	C. H. Ironmonger	Greenmount Cream Lad (18577)

Kapara Happy Days 2nd ..	do.	93309	3-12-41	25-5-48	273	14·0	6,522	5·50	358·84	D. Bradford ...	Grantham Easter Oxford (14677)
Walgett Jocelyn	do.	89500	13-8-40	26-5-48	273	7·5	6,532	5·49	358·84	C. J. Cunningham ...	Selsey Wyandotte's Prince (18058)
Mereworth Oxford Montrose	do.	2732	4-5-43	28-6-48	273	13·5	7,015	5·11	358·41	B. Langridge .	Clarendon Eyre Oxford Pioneer (11484)
Grass Vale Lady Fowler 32nd	do.	86644	11-6-41	28-5-48	273	7·0	6,981	5·12	357·57	R. H. Rose & Son .	Mornmoot Northwood Beau (17798)
Walgett Joyful ...	do.	79450	29-8-38	29-3-48	273	21 0	6,723	5·26	353 74	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Ferndale Jean 6th .	A.I.S.	30500	10-1-38	29-9-47	273	26 0	10,818	3·25	352 30	G. W. Marston	Tabbagong Hinkler (261)
Tipperary Beauty 16th	do.	47483	22-11-42	23-12-47	273	11 0	8,328	4·21	350 98	W. G. Burges .	Tipperary Ace (6336)
Walgett Royal Joy	Jersey		2-5-43	12-5-48	273	8 0	5,469	6·36	348·07	C. J. Cunningham .	Selsey Wyandotte's Prince (18058)
Tirano Lorna .	A.I.S.	47509	20-12-40	22-6-48	240	7 0	8,160	4·24	345·78	J. H. Bensted & Co.	Chittering Prince (3800)
Camden Cleopatra	Jersey	91041	31-3-42	18-5-48	273	6 0	5,343	6 47	345·55	T. O Abbott	Greenmount Golden Sultan (14688)
Lenmoor's Bluebell	A.I.S.	37898	12-4-42	30-7-48	180	14 5	8,655	3 98	344 23	G. W. Marston	Ferndale Memento (3194)
Denmark Diana	Guernsey	6963	28-6-36	21-2-48	273	17 5	6,120	5 61	343·50	Denmark Research Station	Denmark Damon (2519)
Camden Circe ..	Jersey	80637	24-9-39	4-2-48	273	8 5	5,556	6 15	341·88	K. V. Gray	Greenmount Golden Sultan (14688)
Lenmoor's Joan . .	A.I.S.	31611	13-8-39	30-6-48	240	16 5	8,505	4 00	340·44	G. W. Marston .	Ferndale Memento (3194)
Walgett Delightful	Jersey		21-4-43	16-5-48	273	9 5	6,358	5·26	334·66	C. J. Cunningham .	Selsey Wyandotte's Prince (18058)
Juadine Julienne	do.	87020	2-3-40	17-7-48	240	21 0	7,095	4 71	334·23	Mrs. M. A. Watson	Austral Park Wonderful Standard (12423)
Mereworth Oxford Buttercup 2nd	do.	..	9-5-43	1-9-48	273	14 0	6,282	5·28	331·94	B. Langridge	Clarendon Eyre Oxford Pioneer (11484)
Koojan Ace's Bluebird ..	Guernsey	10686	9-6-42	17-11-47	273	15 5	6,871	4·80	330·39	Darnell Bros. .	Homestead Ace (Imp.) (1631)
Radyr Park Dorothy 16th .	Jersey	88643	4-6-41	20-1-48	273	21 0	6,508	5·07	330 04	L. M. Temple .	Navua Coronation Star (14929)
Inverell Hope 2nd . .	A.I.S.	44575	12-8-42	19-9-48	273	18·0	8,349	3·91	326·42	M. H. Montgomery	Liberton Venturer 2nd (7132)
Radyr Park June	Jersey	73603	12-6-38	19-7-48	273	6 0	7,183	4·53	325 63	L. M. Temple	Navua Coronation Star (14929)
Clovelly Golden Pride	Guernsey	8501	26-10-38	22-6-48	273	5 5	6,856	4·73	324·82	J. Cabassi	Drakesbrook Golden Gift (2651)
Tipperary Beauty 13th	A.I.S.	40634	23-1-41	10-9-48	273	11·0	8,088	3 99	323 32	M. H. Montgomery	Blacklands Monarch's Commander (1877)
Valencia Vale Chloe . ..	Jersey		8-6-40	19-7-48	273	9 0	5,802	5 56	322 89	K. V. Gray	Grass Vale Fowler's Twylish (12733)
Rutherwood Dinah	Guernsey	9324	3-11-39	28-8-48	273	13 0	6,642	4·85	322·29	Misses E. & I. Rutherford	Denmark Robin Hood (3322)
Denmark Rosette .	do.	6972	21-7-36	7-11-47	273	18 0	6,804	4 72	321·58	Denmark Research Station	Koojan Golden Prosper (2283)
Grass Vale Norawood	Jersey	92724	27-6-42	25-6-48	240	8 0	6,015	5 35	321·02	R. H Rose & Son	Mornmoot Northwood Beau (17798)
Maldon Primrose .	A I.S.	45232	1-6-43	19-6-48	210	14 0	7,905	4 04	319·71	W. H. Doyle & Son	Capel Great Star (5580)
Claremont Blossom 29th	do.	29717	26-3-39	6-10 47	273	21 0	9,063	3 52	319 42	Claremont Hospital for Insane	Wooroloo Jean 2nd's Guardian (4488)
Mayvale Discoverer's Anemone	Guernsey	10864	16-7-40	27-10-47	273	16 0	6,753	4 72	319 00	R. J. Giles .	Koojan Ideal's Discoverer (4968)
Radyr Park Coronation's Estrellita	Jersey	83555	27-7-39	7-7-48	240	13 0	5,960	5 32	317·25	L. M. Temple	Navua Coronation Star (14929)
Greenmount Marion	do.	86666	7-5-41	7-7-48	273	13 0	6,934	4 55	315 51	K. V. Gray	Bellgonia Peggy 6th's Aim (17263)
Lenmoor's Queen 3rd	A.I.S.	45029	12-11-41	28-7-48	240	16·0	8,550	3 62	309·81	G. W. Marston	Ferndale Memento (3194)
Claremont Cherry 15th	do.	29719	1-8-38	27-12-47	273	19 0	7,247	4 24	307 19	Claremont Hospital for Insane	Claremont Max Hero (3802)
Clovelly Golden Flirt .	Guernsey	8500	1-6-39	8-4-48	273	15 5	6,496	4·72	306·62	J. Cabassi .	Koojan Monogram (4174)
Denmark Angeline ..	do.	6956	4-7-37	12-7-48	273	12 0	5,781	5·26	304·51	Denmark Research Station	Koojan Golden Prosper (2283)
Ardersia Northern Lady	Jersey	79996	18-4-40	14-7-48	273	7·5	5,287	5·71	303·27	T. M. Smith .	Travalgan Northern Airman (13312)
Tirano Madame	A.I.S.	54230	22-5-43	22-6-48	210	18·0	8,360	3·55	296·64	J. H. Bensted & Co.	Chittering Prince (3800)
Kapara Sparkles Lassie 2nd	Jersey	98818	14-10-42	31-5-48	273	14·0	6,662	4 42	294·60	W. L. Bradford ...	Congelin Jolly Eminent 3rd (18425)
Juadine Fairy ..	do.	93213	12-6-43	19-7-48	240	5·0	4,890	5·99	292·74	K. V. Gray	Juadine Northwood Beau (19670)
Rutherwood Robin's Rosa	Guernsey	9330	30-8-38	17-8-48	273	17·0	5,901	4·93	290·78	Misses E. & I. Rutherford	Denmark Robin Hood (3322)
Rosella Jeanette . .	do.	14397	2-4-42	6-5-48	273	12·5	4,917	5·87	288·47	Darnell Bros. .	Muresk Commander (9599)
Colmyn Golden Marigold ...	Jersey	80802	17-7-40	4-3-48	273	22·5	6,712	4·26	286·36	C. H. Ironmonger ...	Clarendon Eyre Golden Oxford (13606)

TABLE 8—PURE BRED HERD TESTING—*continued.*

Cows which completed test during the twelve months ended 30th June, 1949—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 5 YEARS OLD AND OVER—STANDARD 350 LB. BUTTER-FAT—*continued.*											
Radyr Park Dorothy 14th	do.	95266	22-4-41	21-11-47	273	14·0	6,032	4 73	285·52	L. M. Temple	Navua September Lad (14023)
Norinya Noreen	Jersey	73200	6-11-37	24-9-47	240	10 0	6,360	4 46	283 87	A. G. Eckersley	Juadine Prince (14760)
Mayvale Golden Buttercup 2nd	Guernsey	10869	14-7-42	21-10-47	273	15·0	5,385	5·24	282·46	R. J. Giles	Koojan Ideal's Discoverer (4968)
Denmark Dawn 2nd	do.	5439	21-3-35	22-4-48	240	13·5	4,770	5·79	276·33	Denmark Research Station	Koojan Golden Prosper (2283)
Denmark Lady Diana 2nd	do.	12687	29-10-42	19-8-48	273	6·5	4,155	6·57	272·94	do. do.	Denmark Dawn's Apollo (4785)
Clovelly Dainty	do.	10241	5-8-41	20-8-48	210	10·0	6,240	4·31	270 42	J. Cabassi	Koojan Monogram (4174)
Juadine Queen	Jersey	87022	20-5-40	5-7-48	273	5·0	4,920	5·47	269·49	Davies & Sons	Austral Park Wonderful Standard (12423)
Mereworth Starbright's Vanilla 3rd	do.	77709	12-6-38	21-9-48	240	12·0	4,995	5·39	269·40	B. Langridge	Mereworth Rye Duke (13935)
Murra Murra Easter's Marina	do.	94625	20-4-42	6-4-48	273	12·5	4,987	5·36	267·40	Mrs. M. A. Crute	Grantham Easter's Monarch (11656)
Denmark Golden Dawn	Guernsey	4118	9-1-33	23-1-48	273	19 0	4,812	5·54	267·01	Denmark Research Station	Koojan Golden Prosper (2283)
Carydale Roberta	A.I.S.		13-3-43	20-9-48	273	9 0	6,987	3 77	263·58	M. H. Montgomery	Summerlea Robin Hood (5261)
Tirano Katoomba 2nd	do.	47508	12-2-43	29-7-48	180	29 0	6,660	3 95	263 40	J. H. Bensted & Co.	Chittering Prince (3800)
Lenmoor's Gentle	do.	51741	22-5-41	5-8-48	210	9.5	6,735	3 91	263.37	G. W. Marston	Wooroloo Union Jack (7662)
Capel Fairy 2nd	do.	35368	10-8-41	24-7-48	180	15 0	6,115	4 30	263 13	W. H. Doyle & Son	Valliere Commodore (6360)
Narrogin Colleen	do.	38665	22-8-41	12-4-48	273	17 0	5,403	3 89	262 06	Narrogin School of Agriculture	Westby Masterpiece (5403)
Valliere Primrose	do.		19-5-40	8-5-48	210	19 0	6,360	4.07	259 11	W. K. Barnes	Alfa Vale Patrico (3649)
Mayvale Discoverer's Anemone	Guernsey	10864	16-7-40	1-12-48	180	21 0	5,460	4 66	254 70	R. J. Giles	Koojan Ideal's Discoverer (4968)
Mokine Empire Lily 35th	Jersey	2860	29-6-42	2-10-47	240	9 5	4,920	5 15	253 38	K. V. Gray	Selsey Hall Boy (15136)
Wooroloo Gladys 2nd	A.I.S.		3-2-42	6-3-48	240	9 0	5,670	4 39	249 21	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Claremont Biddy 71st	do.	42585	18-11-42	26-6-48	210	11.0	6,495	3 82	247 86	W. K. Barnes	Westby Monarch (5404)
Radyr Park Dorothy 22nd	Jersey	3477	7-6-43	29-6-48	180	15 5	4,035	6 09	246 00	F. Campbell	Navua September Lad (14023)
Mereworth Vanilla Queen 4th	do.	94249	30-6-42	13-4-48	273	5 5	6,001	4 09	245 72	B. Langridge	Clarendon Eyre Oxford Pioneer (11484)
Clovelly Primrose	Guernsey	10245	30-6-42	19-7-48	240	10 0	4,980	4 93	245 55	J. Cabassi	Koojan Monogram (4174)
Valliere Milkmaid	A.I.S.	40824	15-4-40	7-5 48	240	11 0	6,480	3 79	245 37	W. K. Barnes	Alfa Vale Patrico (3649)
Mereworth Starbright's Audrey 6th	Jersey	7691	7-4-43	29-6-48	273	12 5	4,965	4 78	237 39	B. Langridge	Clarendon Eyre Oxford Pioneer (11484)
Rutherwood Anne	Guernsey	14480	7-5-43	21-8-48	273	13 0	4,704	4 96	233.23	Misses E. & I. Rutherford	Rutherwood Robin Adair (5238)
Valliere Marigold	A.I.S.	47695	2-7-43	30-7-48	180	10 5	5,265	4 38	230 43	W. H. Doyle & Son	Wooroloo Noble 4th (6411)
Woodford Julie's Primrose	Guernsey	15200	29-9-42	28-5-48	273	8 0	4,689	4 88	229 04	W. R. Ferry	Yarraview Julian (4634)
Mereworth Butter Queen 4th	Jersey	82784	18-8-39	27-12-47	273	10 5	4,411	5 19	228 94	B. Langridge	Grantham Easter's Oxford (14677)
Murra Murra Easter's Maid	do.	88033	4-5-40	15-8-48	150	14.5	3,900	5 87	228 90	Mrs. M. A. Crute	Grantham Easter's Monarch (11656)
Rutherwood Fairy	Guernsey	11447	28-11-41	2-9-48	273	9 0	4,287	5 32	227.99	Misses E. & I. Rutherford	Rutherwood Sailor (5240)
Ferndale Jean 6th	A.I.S.	30500	10-1-38	20-8-48	180	26 0	6,720	3 36	225 84	G. W. Marston	Tabbagong Hinkler (261)
Mereworth Oxford Gay	Jersey	....	12-5-43	18-8-48	210	13.5	4,695	4.79	225.08	B. Langridge	Clarendon Eyre Oxford Pioneer (11484)

Wooroloo Greta	A.I.S.	48108	26-12-42	11-8-48	240	8.0	5,190	4.25	220.67	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Carydale Golden Gem	Jersey	91110	15-6-41	6-8-48	150	22.5	4,500	4.89	220.41	G. Layman	Clarendon Eyre Golden Oxford (13606)
Wooroloo Doreen 5th	A.I.S.	41176	22-3-42	24-2-48	273	11.0	5,223	4.20	219.76	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Brackenhurst Queen	do.		15-10-38	3-11-47	240	8.5	6,600	3.21	217.50	G. W. Marston	Thornleigh Champagne (930)
Juadine Julienne 3rd	Jersey	2119	19-8-43	24-9-48	180	13.5	4,050	5.34	216.31	B. Langridge	Juadine Northwood Beau (19670)
Wooroloo Polly 3rd	A.I.S.	48127	6-6-43	5-10-48	210	5.0	4,590	4.58	210.27	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Brackenhurst Queen	A.I.S.		15-10-38	9-10-48	150	16.0	5,685	3.63	206.61	G. W. Marston	Thornleigh Champagne (930)
Mereworth Starbright's Queen 5th	Jersey		9-5-43	6-7-48	240	9.0	4,200	4.86	204.21	B. Langridge	Grantham Oxford Standard (18571)
Mokine Empire Lily 35th	do.	2860	29-6-42	17-10-48	273	7.0	4,536	4.43	201.08	K. V. Gray	Selsey Hall Boy (15136)
Camden Athena	do.	91040	30-7-41	27-5-48	240	5.0	3,300	6.09	200.94	T. O. Abbott	Greenmount Golden Bobbie (18578)
Mokine Empire's Twylish 15th	do.	99412	1-4-43	15-7-48	273	5.5	3,496	5.66	197.94	Davies & Sons	Mokine Brigadier (18799)
Capel Green Princess	A.I.S.	35371	22-8-41	7-7-48	150	19.5	4,635	4.12	191.28	W. H. Doyle & Son	Monks Green Chummy (5971)
Wooroloo Rose Marie 3rd	do.	48134	12-1-43	13-8-48	210	7.0	4,575	4.18	191.25	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Mayvale Discoverer's Buttercup 2nd	Guernsey		14-7-42	30-11-48	120	22.5	4,275	4.45	190.45	R. J. Giles	Koojan Ideal's Discoverer (4968)
Glanavon Dahlia 17th	A.I.S.		21-11-42	29-1-48	180	24.0	4,890	3.81	186.12	D. Bevan & Sons	Blacklands Monarch's Commander (1877)
Capel Lottie 3rd	do.	42456	1-10-42	7-8-48	150	17.5	4,035	4.56	183.96	W. H. Doyle & Son	Valliere Commodore (6360)
Casterton Sunbeam	Guernsey	10237	1-3-42	16-10-48	120	28.5	3,855	4.58	176.67	J. R. Giles	Casterton Illustrious Gem (4763)
Clovelly Margaret	Guernsey	6929	20-11-37	13-5-48	210	15.0	3,780	4.66	176.22	J. Cabassi	Nornabank Brian (3640)
Grantham Easter Rye 9th	Jersey	81610	12-7-39	8-3-48	273	10.0	3,075	5.67	174.51	A. Tomerini	Clarendon Eyre Oxford Pioneer (11484)
Woodford Gladys	Guernsey	15199	23-3-43	23-5-48	120	26.0	3,720	4.64	172.62	W. R. Ferry ...	Yarraview Clarinet 2nd (4629)
Mayvale Rosy Aster	do.	10870	27-9-40	17-12-48	120	21.0	3,450	4.77	164.61	R. J. Giles	Denmark Rosy Outlook (4017)
Grass Vale Nora's Maid	Jersey	98527	9-9-41	29-6-48	90	39.0	3,630	4.47	162.36	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Narrogin Daisy Bell	A.I.S.	38665	10-10-40	16-3-48	210	13.0	4,410	3.65	161.19	Narrogin School of Agriculture	Westby Masterpiece (5403)
Muresk Dame Enid	Guernsey	11061	17-5-42	6-1-48	180	11.5	3,870	4.08	158.01	R. J. Giles	Muresk Arthur (4338)
Grantham Dreaming Fairy 2nd	Jersey	76596	20-4-39	14-7-48	180	16.0	3,285	4.78	156.96	A. Tomerini	Clarendon Eyre Oxford Pioneer (11484)
Mayvale Golden Diana	Guernsey	13663	6-9-42	30-11-47	240	7.0	3,630	4.29	155.70	R. J. Giles	Koojan Ideal's Discoverer (4968)
Grass Vale Magnolia 4th	Jersey	86645	23-11-41	17-5-48	60	51.5	3,000	5.18	155.40	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Grantham Beautiful Carnation	do.	92702	3-2-42	12-8-48	150	21.5	3,720	4.13	153.73	A. Tomerini	Rosecliffe Marchalong (15904)
Denmark Mary's Bonnie	Guernsey	10295	22-7-41	13-3-48	150	15.5	3,255	4.62	150.54	Denmark Research Station	Denmark Lady's Goldseeker (4799)
Mayvale Rosy Aster	do.	10870	27-9-40	2-12-47	240	10.0	3,350	4.44	148.89	R. J. Giles	Denmark Rosy Outlook (4017)
Wooroloo Ena	A.I.S.	48101	15-1-43	6-8-48	90	32.0	3,630	3.91	142.20	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Radford Park Poppy Queen	Jersey	95268	9-9-40	30-8-48	180	4.0	2,700	5.19	140.19	Radford Park Co.	Mokine Dunce (11896)
Lenmoor Rosy	A.I.S.	45032	18-8-43	15-9-48	180	9.0	3,525	3.77	133.05	W. K. Barnes	Ferndale Radiant (5729)
Kapara Duchess	Jersey	98815	14-9-42	15-5-48	90	33.0	2,760	4.78	131.94	D. Bradford	Congelin Mandarin (14542)
Tipperary Pretty Maid 3rd	A.I.S.	47499	7-10-43	2-1-49	60	49.0	3,150	4.10	129.24	W. G. Burges	Tipperary Ace (6336)
Rosella Sweetheart	Guernsey	11429	30-7-40	8-7-48	120	16.5	2,820	5.08	127.44	Darnell Bros.	Muresk Paul (4356)
Lenmoor's Roma	A.I.S.	45031	16-8-43	15-9-48	180	6.0	3,405	3.65	124.55	W. K. Barnes	Ferndale Radiant (5729)
Camden Arachne	Jersey	80635	9-9-39	24-8-48	180	4.5	2,405	5.12	123.21	K. V. Gray	Greenmount Golden Sultan (14688)
Rosella Duchess 2nd	Guernsey	9310	7-5-39	31-7-48	90	15.5	1,980	6.05	119.79	Darnell Bros.	Muresk Paul (4356)
Brookfield's Bonnie Blossom	do.	5319	15-8-34	22-7-48	120	15.5	2,265	5.26	119.25	do.	Koojan Lord Barklay (1031)
Wooroloo Sunlady 5th	A.I.S.	48141	23-4-43	13-9-48	60	41.0	2,790	3.99	111.56	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Koojan Ace's Diplomat	Guernsey	13489	28-8-43	6-10-48	60	30.0	2,160	4.84	104.58	A. W. Padbury	Homestead Ace (Imp.) (1631)

TABLE 8—PURE BRED HERD TESTING—*continued.*

Cows which completed test during the twelve months ended 30th June, 1949—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 5 YEARS OLD AND OVER—STANDARD 350 LB. BUTTER-FAT—*continued.*											
Juadine Jewell 4th	Jersey	.	4-10-43	15-10-48	60	28.0	1,830	5.64	103.37	F. Campbell	Juadine Northwood Beau (19670)
Rutherwood Dame	Guernsey	7825	9-7-36	12-8-48	120	22 0	2,700	3.78	102.24	G. Brenton	Denmark Damon (2519)
Radford Park Marigold	Jersey	95259	10-8-41	6-5-48	240	4 0	1,140	5 28	60.18	Radford Park Co.	Mokine Dunce (11896)
Capel Beauty	A.I.S.	35365	15-6-41	16-7-48	60	29 0	1,740	3.26	56.79	W. H. Doyle & Son	Valliere Commodore (6360)
Mereworth Oxford Makanora	Jersey	.	28-6-43	17-3-49	30	32.5	975	5.10	49.80	B. Langridge	Clarendon Eyre Oxford Pioneer (11484)
Radyr Park Dorothy 23rd	do.	3478	19-6-43	16-11-48	30	35.0	1,050	3 88	40 80	F. Campbell	Radyr Park September Lad (823)
Mereworth Oxford Vanilla 3rd	do.	99301	30-4-43	15-2-49	30	20.0	600	4.97	29.82	B. Langridge	Clarendon Eyre Oxford Pioneer (11484)

Influence of Month of Calving on Length of Lactation and Average Yield of Butterfat

GRADE HERD RECORDING.

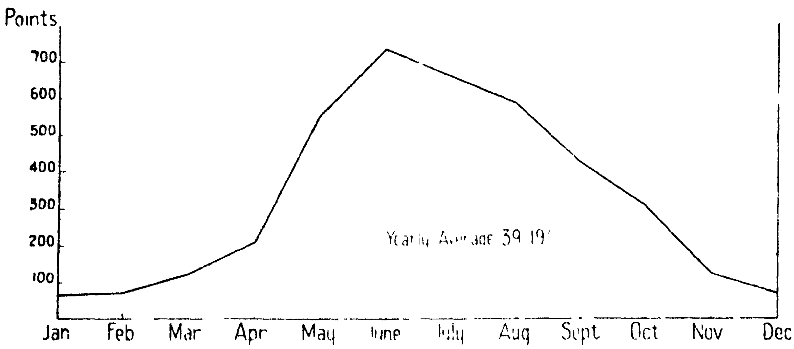
M. CULLITY, Superintendent of Dairying.

DAIRYING in Western Australia is confined almost entirely to the South-Western portion of the State which experiences a Mediterranean type of climate. With the season breaking in April, one experiences heavy winter rains, followed by mild springs and dry summers. The distribution of rainfall throughout the year can be seen from Graph 1, which shows rainfall per month, the average of six key centres in the dairying districts. Furthermore rainfall is very regular in its monthly trend from year to year with the result that farmers, profiting by the experience and technical advances gained since the beginning of the century, now practice a definite pattern of farming.

Graph I

Rainfall per Month

Average of 6 Key Centres in the Dairying Districts over 42 years



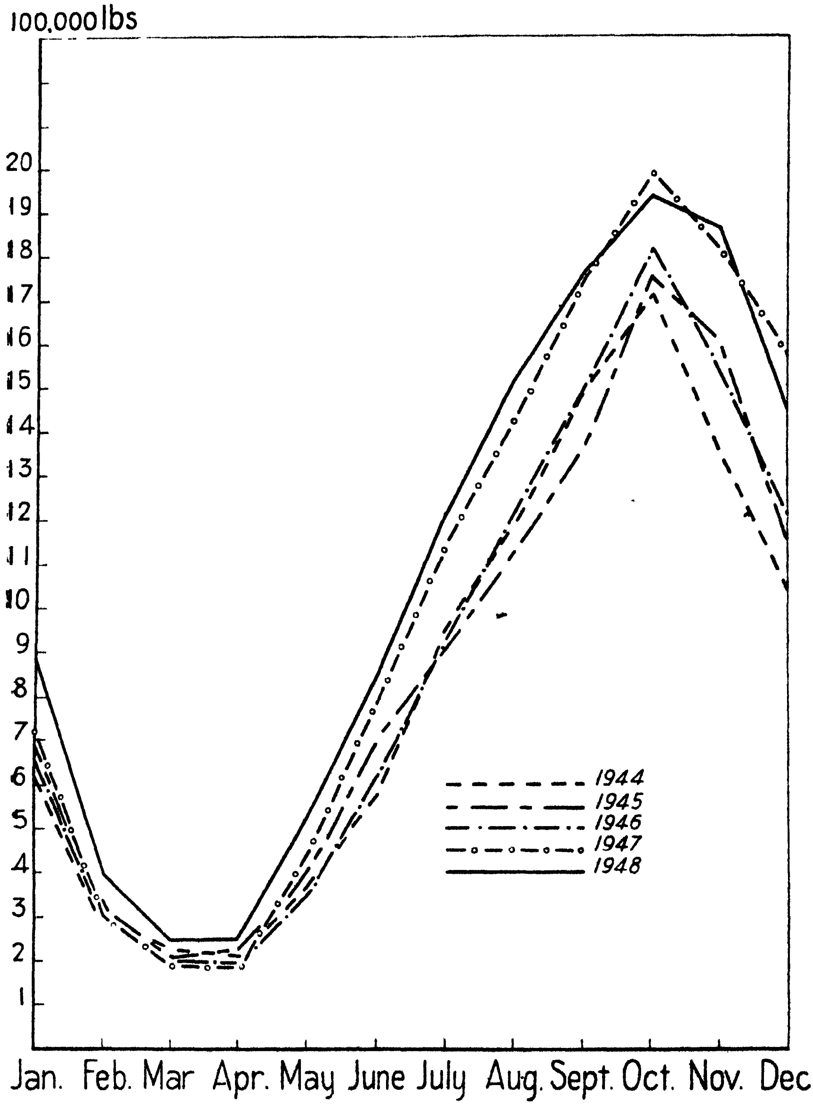
The early practice of "coast" farmers was to calve their cows down in August or September with the flush of spring feed. As the feed supply dwindled in the summer, cows were dried off and turned out to the coast to fend for themselves. Then, after a long dry spell of six to nine months, the cows were again brought into lactation. With the introduction of subclover and the practice of topdressing with super in the '20's, new possibilities were opened to the industry. Cattle numbers increased rapidly and gradually cows were calved earlier. Fodder conservation commenced and made possible the milking of cows into the summer months further increasing the lactation period.

The commercial dairy farmer now seeks to calve cows down in the autumn, and aims at freshening cows every twelve months with a dry spell of two months or more in late summer. This tendency can be seen from Graph 2, which shows monthly production of butterfat over a number of years, and for the year 1948-49

separately. It will be seen that production reaches a low in February, March and April and commences to rise as cows are freshened in the autumn, reaching a peak in October-November when almost all cows are in milk.

Graph II

Butterfat Production per Month 1944-48



Production According to Month of Calving.

With the regular seasonal trend of rainfall and green feed resultant upon it, one would expect to find some trend in average yields of milk and butterfat according to month of calving. This has been investigated by the Department and data

have been accumulated since 1936, covering 70,531 lactations over 10 years. Findings have been referred to in reports on Grade Herd Recording in earlier issues of this Journal and are brought up to date in the present article. Details are given in Table 1, and the accompanying Graph 3.

GRAPH 3.

Butterfat Production with Relation to Month of Calving, 1936 to 1942 and 1946 to 1949.

TABLE 1.
PRODUCTION OF COWS ACCORDING TO MONTH OF CALVING.

	1948–49.		7 years, 1936–42, and 3 years, 1946–49.	
	No. of Lactations.	Average Butterfat. lb.	No. of Lactations.	Average Butterfat. lb.
January	194	101.5	991	172.8
February	246	147.7	1,589	193.1
March	605	226.5	4,892	224.6
April	1,727	237.5	11,644	239.3
May	2,146	229.0	12,945	235.4
June	2,003	215.4	12,737	229.6
July	1,472	200.6	11,620	221.4
August	970	167.6	6,905	192.7
September	632	139.5	3,541	171.3
October	369	116.2	1,959	159.5
November	236	95.4	968	165.5
December	213	98.8	740	132.5
Totals	10,813		70,531	

Percentage of Cows Calving Each Month.

The number of cows calving in the optimum period (March-July) can be seen from Table 2, which shows the percentage of cows calving in each month for the State as a whole in the three years 1936-37, 1940-41 and 1948-49. The year 1948-49 is further divided into two sections (i) Brunswick and all units further North and (ii) all units South of Brunswick. It will be seen that the monthly percentage is very constant both from one year to another and also from one district to another. In all cases approximately 75 per cent. of cows freshen in the five months March-July.

Table 2 shows also that approximately 25 per cent. of cows do not calve in this period. The gradual decline in the percentage calving each month after July may be taken as an indication that efforts were continuing to get the cows in calf.

TABLE 2.

District	Brunswick and North.		South of Brunswick.		Whole State.		Whole State.		Whole State.	
Year	1948–49.		1948–49.		1936–37.		1940–41.		1948–49.	
Month—										
January	2.4		1.7		2.0		1.3		1.8	
February	4.3		1.9		2.9		2.6		2.3	
March	4.4		5.9		7.2		8.2		5.7	
April	19.3		15.5		14.9		16.4		15.2	
May	22.3	74.5	19.4	73.4	17.4	75.0	17.2	75.2	19.9	73.1
June	17.1		18.7		17.7		17.0		18.6	
July	11.4		13.9		17.8		16.4		13.7	
August	5.7		9.5		9.5		9.9		9.1	
September	4.8		6.0		5.3		5.1		5.9	
October	3.0		3.5		2.8		2.7		3.5	
November	2.4		2.1		1.3		1.9		2.2	
December	2.9		1.8		1.0		1.3		1.9	

It is probable that failure to conceie at first, or subsequent services, is the main cause of so many cows freshening outside the optimum period, and that closer attention by dairy farmers to the health and management of the herd at mating time may bring more satisfactory results. Many cows fail to conceive at early service owing to one or other type of infection of the genital tracts. The regular use of an after calving pessary for all cows is a precaution which is suggested to all farmers. A mixture of iodoform and boracic acid in equal parts by weight in a No. 10 gelatine capsule is most effective.

Proper control of the bull will permit an intelligent supervision of mating. If best results are to be expected, the bull should not be permitted to run with the herd at mating time otherwise there is danger of delayed conception on the part of many cows passing unnoticed. In larger herds there is also the possibility of the bull being overworked.

Length of Lactation.

Length of a lactation is an important contributing factor to total production of that lactation. If, as is considered desirable, cows are being freshened every twelve months, then the longer the lactation up to ten months, the greater the yield of that lactation. Furthermore the dry spell of two months should be sufficient for the cow to regain condition and commence the next lactation at a high level, provided ample feed is available during the dry spell. Many herds fall short of this length of lactation as can be seen from Table 3, which shows the average length of lactation for each unit according to month of calving for the period 1945-47.

It will be seen that districts vary somewhat, Metricup unit having the longest average length of lactation (8.0 months) and Vasse-Jindong the shortest (5.9 months). This average includes all lactations of 90 days or more whatever the cause of discontinuance of test at a later date. The average length of lactation over all districts is shown on the bottom line of the table. There is a definite trend acording to month of calving, the length of lactation being greatest in cows calved in March and least in cows calved in October. This is illustrated in histogram form in Graph 4.

TABLE 3.

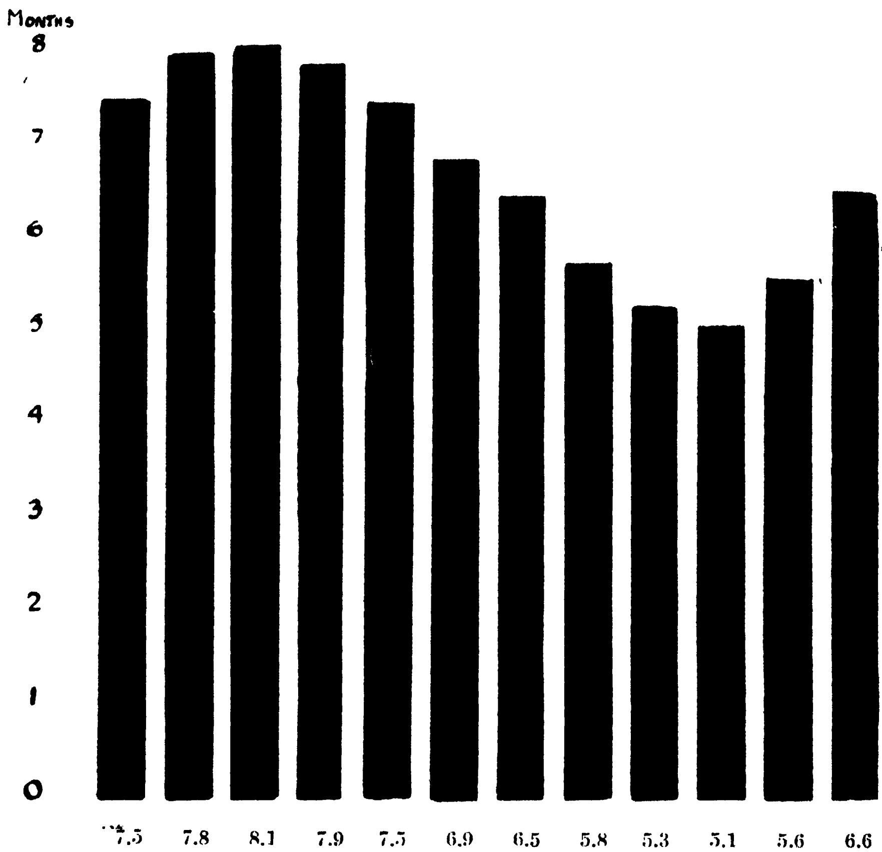
DURATION OF LACTATION IN RELATION TO MONTH OF CALVING 1945-47.

Unit.	Average Duration (in months) of Lactation Period of Cows Calving in Month of:												Unit Yearly Average.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Months.
Metricup	8.0	8.1	8.5	8.4	8.2	7.7	7.9	6.6	6.4	4.5	5.0	7.7	8.0
Waroona	8.0	8.2	8.3	8.3	7.9	7.8	7.7	7.1	7.5	7.5	8.5	8.0	7.9
Margaret River	7.7	6.9	8.3	8.7	8.0	8.3	7.8	6.7	6.5	7.0	7.0	7.5	7.8
Cowaramup, S.	7.7	8.0	8.6	8.2	8.4	7.8	7.4	6.5	5.9	5.2	4.5	7.0	7.7
Cowaramup, N.	8.0	8.2	8.4	8.2	7.9	7.3	7.2	6.4	6.0	6.0	7.1	6.0	7.6
Pemberton	9.0	9.0	8.7	8.3	8.4	8.2	7.7	6.6	5.5	5.3	4.7	4.0	7.3
Balingup		7.7	8.2	8.2	8.0	7.1	6.3	5.6	5.0	4.2	4.0		7.2
Harvey	7.6	8.0	8.0	7.3	7.5	7.4	6.8	6.1	6.2	6.0	6.2	6.7	7.2
Albany	5.0	7.6	8.0	7.6	7.7	6.6	6.2	7.1	6.5	5.8	7.7	6.5	7.0
Donnybrook	9.0	7.5	8.2	8.1	7.1	7.0	5.7	5.7	5.0	5.9	5.7	7.8	6.9
Northcliffe	6.8	7.5	8.5	7.8	7.5	7.7	6.9	6.9	5.3	4.8	4.5	5.4	6.9
Mt. Barker	6.3	8.4	8.0	7.7	7.5	7.0	6.6	6.0	5.2	4.8	4.2	4.2	6.8
Pinjarra	8.0	8.0	8.2	7.6	7.3	6.2	6.0	5.4	4.7	4.5		8.0	6.8
Forest Grove	7.3	7.6	7.6	7.4	7.0	6.7	6.2	5.1	5.0	4.1	4.2	7.1	6.6
Manjimup	6.3	7.4	8.7	8.6	7.8	7.0	6.6	6.2	5.5	4.5	5.0	4.0	6.6
Bridgetown	6.0	7.1	8.0	8.0	7.2	6.4	5.7	4.7	4.3	3.8	3.0	7.0	6.5
Nannup	6.3	8.7	9.0	8.3	8.0	6.4	6.0	4.8	4.1	3.6	4.0	8.0	6.5
Brunswick	7.2	7.0	7.7	7.6	7.0	6.8	6.6	5.8	4.8	5.0	5.6	5.1	6.5
Wilga	4.0	6.5	8.0	7.3	7.1	6.0	5.6	5.0	4.4	3.8	3.0	7.0	6.0
Vasse-Jindong	4.0	6.5	7.3	7.0	6.8	6.0	5.7	4.9	4.4	3.9	3.5	4.0	5.9
All Units	7.4	7.8	8.1	7.9	7.5	6.9	6.5	5.8	5.3	5.1	5.6	6.6	6.9

The importance of keeping cows in production for the full 273 days can be seen from Table 4 which compares the production of cows milking for 273 days with the average butterfat production of all cows in the unit. It will be seen that cows milked for the full period produced 280 lb. butterfat compared to 215 lb. for all cows and 203 lb. for cows milking for a shorter period than 273 days.

GRAPH 4.

Duration of Lactation in Relation to Month of Calving, 1945 - June, 1947.



(Average Length of Lactation Months.)
Average Length of Lactations for all Months, 6.9.

There are some interesting features associated with these results. The average length of lactation is surprisingly short, even for those cows which calve during the optimum months of March, April, May, June and July, viz., 8.1, 7.9, 7.5, 6.9 and 6.5 months respectively. There is little doubt that this is associated with a tendency to regard early calving as a means of avoiding feeding cows in the summer months in order to maintain milk flow. A cow calving early in April should be kept in milk till early in January for a full 273-day lactation. Those calving in May, June and July, need to stay in production until February, March

TABLE 4.

COWS COMPLETING LACTATION.

	Unit.	Percentage of Cows completing Lactation. *	Cows completing 273 days.		Unit Butterfat Average.
			Percentage.	Butterfat Average.	
				lb.	lb.
F	Metricup	56	13	338.27	186.76
L	Donnybrook	78	22	323.72	225.26
Z	Armadale	42	14	316.29	206.28
G	Cowaramup, North	60	40	314.58	257.82
H	Cowaramup, South	60	33	303 70	241.16
X	Northcliffe	73	13	301.00	219.60
J	Rosa Brook	67	34	296.70	255.78
C	Harvey	80	30	289.70	222.90
A	Pinjarra	80	20	284 84	212.10
W	Denmark	46	69	282.08	251.65
Y	Scotsdale	71	40	280.72	210.84
T	Albany	78	35	280.70	215.29
D	Brunswick	64	24	280 00	225.27
U	Nannup	95	27	276 60	218.31
P	Pemberton	89	36	274.75	207.44
B	Waroona	46	40	273.07	230.79
V	Vasse-Jindong	64	12	271.74	189.93
M	Balingup	98	26	266.42	216.50
E	Ruabon	90	27	265.76	208.93
I	Margaret River	62	41	265.59	228.70
K	Forest Grove	89	30	264.52	224.88
S	Mt. Barker	90	24	255.22	197.68
O	Manjimup	84	16	247.80	184.00
N	Bridgetown	94	11	236.69	182.80
R	Wilga	69	9	231.80	172.83
	Averages	74	26	280.26	214.71

* *i.e.*, 273 days or drying off naturally in a lesser period. Average Butterfat of cows not completing full 273 days:—203.55 lb.

and April respectively for a full period. For the purpose of comparison and assuming all cows calving in April, May, June and July calved on the first of each month, the average lactation period would have concluded on 27th November, 15th December, 27th December, 15th January.

The fallacy of regarding early calving as a means of avoiding the additional labour involved in providing feed for the summer months without losing production may also be seen from a glance at Table 2 in which it is shown that a considerable proportion of cows calve later than the optimum period, e.g. in 1948-49 for every 100 cows the following would need adequate feeding throughout the summer to achieve a full lactation period.

Calving in August	9.1
Calving in September	5.9
Calving in October	3.5
Calving in November	2.2
Calving in December	1.9
Calving in January	1.8
Calving in February	2.3
	26.7

Owing to the lack of green pasture in the summer dry period, cows can be kept in milk only when ample supplies of water, silage, clover hay and concentrates are available.

While there must be provision for a farmer to have a holiday from the routine operations of the farm once per year, it may be pertinent to point out that in the investigations into the cost of production of butterfat, the greatest single factor is labour. One of the simplest and most direct methods of reducing the incidence of this cost, that is achieving greater output per man, is by producing larger yields per cow. The extension of the lactation period of the cows is an easy way of doing this.

It may be achieved by careful calving so that the lactation period will coincide with the growing pasture. Cows calving in March will give a complete 273 days period by December. Practical difficulties may prevent all cows calving in the one month, but an endeavour to have them come in in March will reduce the number calving during the months proved to be unsuitable for high production. Early calving, however, must be accompanied by good husbandry in the provision of ample feed (silage, clover hay, green crops), and by careful attention to the animals during the pre-calving period.

THE FARM SEPARATOR AND VARIATION OF CREAM TESTS

V. B. MONTI, Dairy Instructor.

EVERYONE associated with dairying is familiar with the appearance of the modern centrifugal separator, but how many have taken the time to study the factors influencing the efficiency of this machine.

Mounting.

The Separator should be set on a solid level foundation, preferably concrete for ease of cleansing. This combination of solid and level setting ensures that the machine will run without vibration, thus minimising strain on the wearing parts, ensuring longer life, efficient skimming with a minimum of power, and freedom from accidents.

Maintenance.

As with all machines, especially those of a high speed nature, efficient lubrication is of paramount importance. In oil bath types it often happens that through a leaky seal in the neck bearing, water or milk enters the sump, reducing the lubricating ability of the oil. This defect should be remedied as soon as noticed. The height of the oil in the sump should be checked regularly and any deficiency made good, and the sump drained and refilled at least once a year.

Undue wear on the main spindle can occur through faulty or worn collar bearings, or a worn ball at the foot of the spindle. The ball at the bottom of the spindle should always be so adjusted as to give the cream outlet the recommended clearance above the bottom of the cream discharge pan, otherwise some cream may be thrown into the skim milk pan. In cases of excessive wear, the ball bearing should be renewed. Worn thrust bearings at the top of the spindle cause excessive vibration, disturbing the balance of the bowl. This can be rectified only by replacing the bearing and spring cage. The groove at the top of the spindle

and the pin in the bowl base should be checked for alignment and excessive wear. This is very necessary to ensure the perfect balance so essential to skimming efficiency.

To save strain and excessive wear on the machine, speed should be raised by hand before cutting in the power drive. With a small diameter pulley on the power drive, the belt is liable to slip as it becomes loose and this may be the cause of varying cream tests.

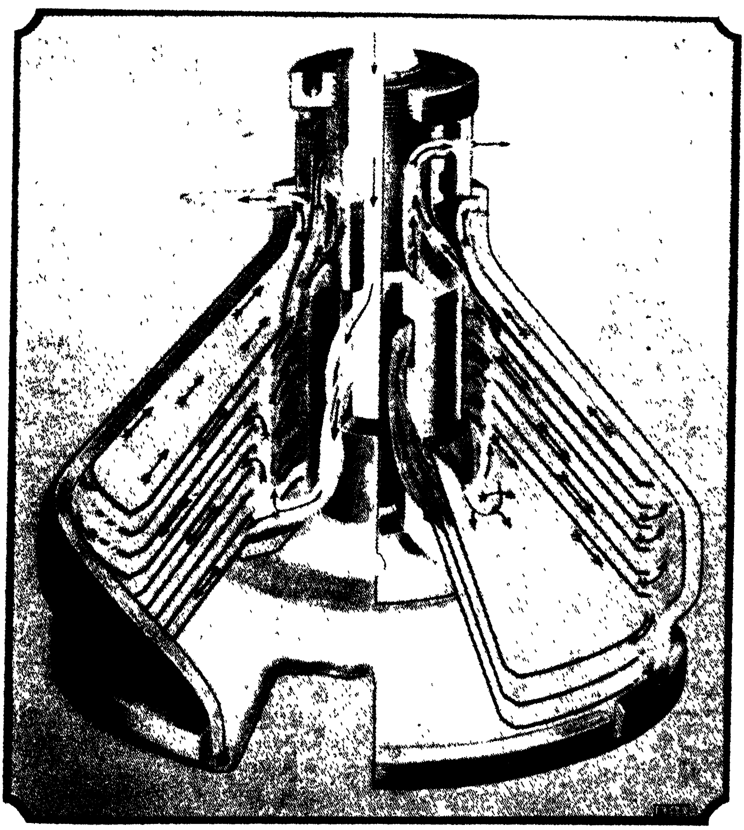
It is most essential that the separator runs smoothly, for this causes the layers of fluid in the bowl to arrange themselves correctly, i.e. cream in the centre and skim milk on the outside, thereby making their way to their respective outlets without interference, and ensuring complete separation.

If vibration occurs there is a mingling of the layers, with excessive loss of butterfat. Experiments have shown the loss to be five times as great when operating under adverse conditions.

What Happens in the Bowl.

The milk is divided into the components, skim milk and cream, by centrifugal force. The heavier skim milk is forced to the outer wall of the bowl and the lighter butterfat accumulates near the centre. It may not be readily realised that

Fig 1.



⟵ = Whole Milk. ⟵‹ = Cream. ⟵« = Skim Milk.

the pressure on the wall of the separator bowl amounts to several tons. Knowing this, the necessity for perfect balance, and smooth running, is more easily understood and appreciated. The centrifugal force is assisted in its work by the internal construction of the bowl. The discs divide the milk into thin layers, and the incline of the discs and the holes in them assist in balancing the centrifugal force causing complete separation of the lighter and heavier fractions. See figure 1.

Factors Influencing the Test of the Cream.

The reasons for variations in the cream test provide a problem which causes much controversy between the farmer and the factory manager. They may be treated in the following order.

Cream Screw.

This regulates the proportion of skim milk to cream, and once it is set, all other factors being equal the separator will deliver the same proportion of cream to skim milk indefinitely. It should not be altered unless a consistently high or low test is being obtained, or for seasonal changes required in tests. Tampering with the cream screw will cause fluctuations in the test. It should be adjusted to give cream of the required consistency and allowed to remain in that position.

Speed of the Machine.

The separator is designed to give the most efficient service at a specified number of revolutions per minute. Below this speed separation is incomplete. Above it, no more efficient separation is gained, but a proportionately greater stress is set up in the machine owing to the greatly increased centrifugal force generated. Increased speed of the bowl above the normal will increase the test of the cream but will not affect the amount of butterfat reclaimed. See figure 2.

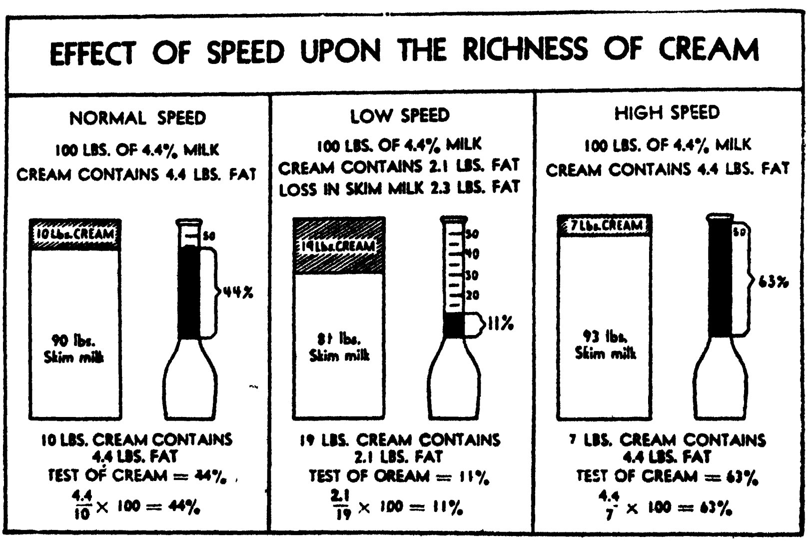


Fig. 2.

(After Hunziker.)

Composition of Herd Milk.

If the cream screw is set to deliver a definite proportion of cream to skim milk, the richer the milk separated, the more butterfat will be concentrated in the cream zone. Changes occur through cows drying off, fresh cows coming in, changes in feed and the culling of low producers. Assuming the cream screw is set to give 15 lb. cream to 85 lb. skim milk, the above changes will be reflected in the cream test. See Figure 3.

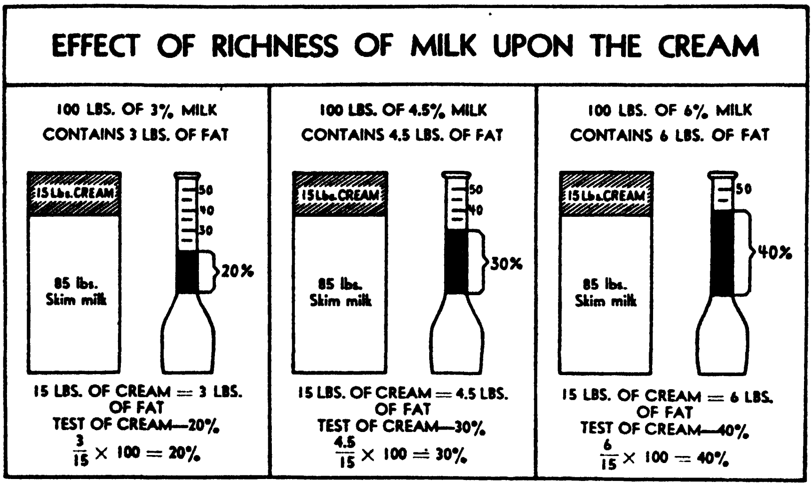


Fig. 3.

(After Hunziker.)

Rate of Inflow.

The rate of inflow of the milk will seriously affect the test because the machine is designed to work at a stated rate of intake; therefore, it is bad practice to try and operate it without a float or to allow the receiving bowl to run dry

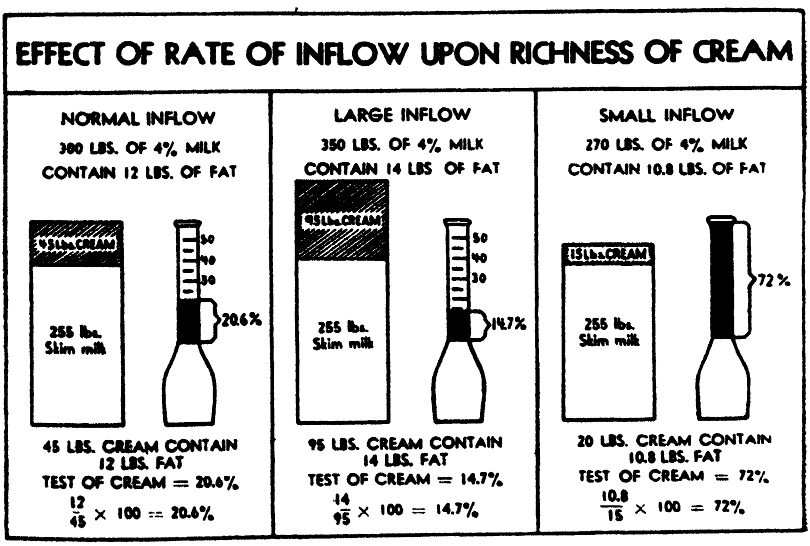


Fig. 4.

(After Hunziker.)

and be filled at intervals from the main reservoir on the milking machine. The bowl should be filled and the outflow balanced by a corresponding inflow from the main tank to maintain a constant level. Other factors being equal the effect of the rate of inflow is as illustrated in Figure 4.

Temperature of Milk.

The temperature of the milk may vause variation in the test and the completeness of separation. This was proved in a series of experiments by Hunziker in which the average loss of fat in the skim milk was .02 per cent. when separation took place at 90-95°F., and .75 per cent. when separated at 50-60°F. This amply demonstrates the value of separating as soon as possible after the milk is drawn, for it will then be in the most suitable condition.

Flushing the Bowl.

The amount of skim milk or water used to flush the separator bowl will also have an effect on the test depending on its volume in relation to the volume of cream. It is recommended that the bowl be flushed with skim milk, using as little as possible and a similar quantity each time.

Cleanliness.

Losses of butterfat are also experienced from a dirty bowl; therefore, from the economic as well as the sanitary point of view the thorough cleansing of the separator each time it is used is essential.

Evaporation.

Holding cream on the farm under normal conditions may slightly increase the test due to the evaporation of some of the moisture content; but it will not increase the total amount of butterfat contained therein, and as the cream ages the increased bacterial action will probably reduce the grade.

SUMMARY.

To Keep the Machine in Good Mechanical Condition:

(a) Install the separator correctly.
(b) Keep correctly adjusted.
(c) Lubricate regularly.

The Cream Test can Vary Through:

(a) Movement of the cream screw.
(b) Varying the speed of the machine.
(c) Variation in the composition of the herd milk.
(d) The rate of flow through the machine.
(e) The temperature of the milk.
(f) The amount and nature of the flushing agent used.
(g) The cleanliness of the separator bowl.
(h) Holding cream on the farm.

CONTAGIOUS PUSTULAR DERMATITIS (SCABBY MOUTH) IN SHEEP

C. R. TOOP, Acting Chief Veterinary Surgeon.

CONTAGIOUS pustular dermatitis or scabby mouth is known to occur in most parts of the world. It affects both sheep and goats and is characterised by the formation of thick greyish-brown scabs on the lips and muzzle and sometimes around the coronets and on the skin of the udders of ewes suckling affected lambs.

It is caused by a filterable virus which is believed to gain entrance to the tissues through slight abrasions in the skin. In uncomplicated cases the disease runs a course of 3-4 weeks at the end of which time the scabs drop off and healing occurs.

Should a secondary infection with bacteria occur, however, healing is delayed and there is suppuration and ulceration of the underlying tissues. Sheep so affected may have difficulty in grazing and lose condition, while in young suckling lambs serious mortality may occur.

Recovery results in the development of a lasting immunity so that in flocks where outbreaks have previously occurred the disease is confined to young sheep and lambs.

Scabby mouth may be prevented by vaccination. A vaccine prepared from the dried scabs is used for this purpose, and is applied to the skin of the inner surface of the thigh after it has been lightly scarified with a suitable instrument. In flocks in which the disease is known to exist it is usually found convenient to vaccinate the lambs at the time of marking, and to adopt this practice as a routine procedure.

Contagious Pustular Dermatitis lesions on lips.

In Western Australia, scabby mouth is widely distributed existing both in the pastoral and agricultural areas where sporadic outbreaks may occur particularly during the drier months of the year. The disease for the most part, occurs in a mild form and is consequently not considered to be of serious economic importance.

In some other States, however, it has been responsible for many disputes and costly delays in shearing, owing to the reluctance of shearers to handle infected flocks. Contagious pustular dermatitis is communicable to man and the handling of affected sheep may result in the development of pustules on the hands and arms, due to the infection of cuts or abrasions by virus contained in the scabs. This condition is not very serious, nor does the risk of infection appear to be great and it could be eliminated entirely by culling all sheep showing evidence of the disease immediately prior to shearing.

Cause.

The disease is caused by a filterable virus and is highly contagious. The virus is contained in the dried scabs in which it is able to survive for long periods.

During recent investigations in New South Wales, it was shown that scabs which had been stored at room temperatures for more than 15 years were still infective. The infection is believed to enter the skin through slight abrasions resulting from grazing on dry or harsh vegetation such as stubble, scrub and grass with sharp awns.

Experimentally the disease may be readily transmitted to susceptible sheep by lightly scarifying the skin and applying a suspension prepared from dried scabs to the scarified area. After an interval of about three days the skin shows evidence of swelling and reddening which is followed by pustule and scab formation, the scabs finally attaining a thickness of ¼ to ½ an inch. In three to four weeks, the scabs commence to lift and become detached, leaving a bare area upon which a regrowth of hair quickly occurs.

Effect on nostrils and lips after acute stage has passed.

If the scabs are forcibly removed, a raw bleeding area is exposed and healing is considerably delayed.

Recovery results in the development of an enduring immunity and thereafter the animal is resistant to further infection.

Symptoms.

Frequently, the scabs are confined to the margins of the lips, and the corners or commisures of the mouth occurring close to the junction of the skin and mucous membrane, but in many cases, the nostrils and muzzle also become involved. Normally, complete healing takes place and the scabs loosen and become detached, within three to four weeks of the appearance of symptoms.

When secondary infection accompanied by suppuration and ulceration of the tissues occurs, healing may be considerably delayed and the condition may be

further complicated as the result of attack by blowflies. Sheep affected by extensive lesions involving the lips and muzzle, may find difficulty in feeding, suffering considerable loss of condition, while young lambs may die of starvation.

In some cases the infection extends to the gums, tongue and palate when swelling and reddening of the mucous membrane occurs. In the case of ewes suckling affected lambs the infection may be transmitted to the skin of the udder resulting in extensive scab formation. Affected ewes may refuse to suckle their lambs and should the udder become overstocked with milk, bacterial infection may supervene resulting in the development of mastitis.

Lesions on the coronets may produce symptoms of lameness. In addition, scabby lesions may occasionally make their appearance on other areas where there is little wool or hair including the face, eyelids, ears, brisket, inside of the thighs and on the scrotum in rams.

"Scabby Mouth"
Note scabs covering muzzle.

Treatment.

Uncomplicated cases of scabby mouth require no treatment. The disease runs a course of three to four weeks following upon which spontaneous recovery occurs. Since the forcible removal of the scabs retards healing, any treatment involving this practice should be discouraged. In the more severe cases where there is ulceration of the tissues, the affected parts should be swabbed with a five per cent. solution of bluestone (1 ounce to the pint) followed by the application of an antiseptic ointment. A mixture composed of creosote 5 parts, sulphur 10 parts and vaseline 100 parts, is usually recommended, but it is probable that the application of carbolised vaseline or zinc ointment would serve the purpose equally well.

Prevention.

Vaccination provides the only effective means of control. On properties where previous outbreaks have occurred, vaccination should be confined to the lambs and should be carried out as a routine procedure at the time of marking. When an

outbreak occurs amongst sheep that have not previously been exposed to infection, it may be brought under control within a few weeks by vaccination of the whole flock.

Contagious pustular dermatitis vaccine is available at the Commonwealth Serum Laboratories and may be procured through the Commonwealth Department of Health. As supplied the vaccine consists of (1) a sealed ampoule containing a powder composed of dried finely ground scabs, (2) a stoppered bottle containing diluting fluid. When the two are mixed sufficient vaccine is produced for the treatment of 500 sheep.

A darning needle cut off through the eye so as to leave two sharp prongs will provide a suitable instrument for vaccination purposes. A supply of these should be prepared to enable a fresh needle to be used after vaccinating each 100 sheep and they should be sterilised by boiling before use.

If the point of the needle is inserted into a cylindrical piece of wood about 2 inches in length, this will serve as a holder. Preparatory to vaccination, lambs should be held over a rail in the position used for marking so as to expose the inner surface of the thigh. The needle is dipped in the vaccine and a slight abrasion or scratch 1½ to 2 inches long is made by drawing it across the bare untreated skin of the thigh.

The needle is again dipped in the vaccine and a second line is drawn parallel to the first and about half an inch distant from it. By this means, the small amount of vaccine carried between the prongs of the needle is introduced into the superficial layers of the skin.

These scarifications should be just sufficient to break the surface layers of the skin, but should not be so deep as to cause bleeding. No antiseptic of any kind should be used since this would destroy the virus and prevent the vaccine from taking effect. Needles should be cleansed after the treatment of each animal by wiping with dry cotton wool in order to remove any dirt or grease gathered from the skin.

A representative number of the animals should be examined after an interval of about a week. Successful vaccination will be denoted by the presence of an even row of pustules along the lines of scarification and this will be followed by the development of the typical scabs. A reaction of this type is referred to a "take" and it is accompanied by the development of a solid immunity which becomes effective after an interval of 14 days and endures for a period of two to three years and possibly throughout the life of the animal. Unless a definite "take" is obtained in susceptible sheep, no immunity may be expected. It should, however, be recognised that "takes" will not develop in recovered sheep which have already become immune as the result of previous exposure to infection.

Since contagious pustular dermatitis is transmissible to man, care should be taken when handling the vaccine, to prevent it entering cuts or abrasions in the hands and to avoid pricking the fingers with the needle.

Upon the completion of vaccination, cotton wool swabs used for the cleaning of the needles should be destroyed by burning and the hands should be washed in an antiseptic solution.

Empty vaccine bottles, ampoules, stoppers and needles should be sterilised by immersion in a five per cent solution of lysol (one ounce to the pint of water) for 30 minutes.

GRAIN SORGHUM TRIALS

DENMARK RESEARCH STATION.

H. G. ELLIOTT, Agrostologist; V. E. WESTON, Manager.

GRAIN sorghum trials were instituted at the Denmark Research Station in 1946 and since that time many varieties of grain sorghums have been tested to determine their value or otherwise for the production of grain.

1948-1949 Trials.

During this season a reduced number of varieties was tested as only those varieties that had shown promise in the previous trials were included, together with two recent introductions. Unfortunately, we were unable to incorporate Wheatland CR45 and Westland Milo owing to shortage of seed but commercial Wheatland Milo was substituted.

Soil.

Greyish loam semi-moist summer land adjacent to the Denmark River.

Planting.

Following normal cultivation the seed was planted in rows 3ft. apart on November 12, 1948 Fertiliser used was superphosphate at the rate of 4 cwts. per acre.

Germination.

This was variable owing to the soil moisture depth variation.

Yields.

Yields for both green fodder and grain were taken but unfortunately there are no facilities at the Research Station for completely cleaning the seed, consequently, grain yields as given include a small proportion of chaff and trash. This, however does not interfere with the relative performances of the various varieties.

General Growth.

The varieties were rather slow in coming away in the first month. Later, however, fair to good growth was made under the warmer conditions then prevailing. Two varieties—Atlas, and Pietersburgh White—were noted as outstanding in their general impression on the observers. Two other varieties, Martin and Wheatland Milo—were noted to be of good stooling habit.

Pests and Diseases.

Apparently, there was little damage by pests or diseases; Atlas was noted as being free from any such troubles.

Maturity Periods.

Generally all varieties took rather long to ripen even more so than the maize varieties in an adjoining trial, indicating that earlier varieties than those so far tried are still required.

It appears that most of the grain sorghums are rather erratic in the time of maturing, even from season to season in any one district where tried. This erratic relative maturing is not confined to this State, as it has been a common experience in Queensland and other countries. Results at Denmark in 1947-48 gave four maturity groups whereas in 1948-49 only two distinct classifications regarding maturity could be made.

The first and earlier group displayed a range of maturity times. As in previous seasons, the earliest variety was Hegarie, this being the first type to flower and ripen. Martin and Early Kalo were slightly later in ripening and as regards flowering Martin was considerably later than the other two.

This season, Wheatland Milo ripened after Martin but flowered before it, whereas last season Martin was later in both respects.

The other maturity classification this season included the late varieties, Pietersburgh White and Atlas. Both these kinds were approximately a month later in ripening than Hegarie or Martin. Atlas was so late that the heads were damaged by heavy rain before harvesting was possible and that same hazard would be liable to affect Pietersburgh White in other seasons. Thus the value of these two varieties for grain can be discounted.

Furthermore, variations in maturity periods were reflected in differences in height. Atlas and Pietersburgh White were higher than the other varieties at flowering, and under good conditions would undoubtedly become tall and lank making mechanical or stock harvesting very difficult. Martin was somewhat shorter than the above two late varieties, and taller than the other early types, being 4ft. high at flowering. This was the same height as that given by Martin in the previous year's trial, so there does not now appear to be any great danger that this variety will grow too tall for successful mechanical harvesting. The remaining early varieties were very dwarfed—at least at flowering—and entirely suitable for mechanical harvesting in this regard.

Results.

The following table gives the number of days to flowering, height to flowering, yields of green material in tons per acre and grain yields in bushels per acre. The table is arranged in order of flowering time—

Variety.	Number of Days to Flowering.	Number of Days to Maturity.	Height at Flowering inches.	Green Yield ton/ac.	Grain Yields bus/ac.	Maturity Group.
Hegarie	77	133	18	not taken	60.5	Early
Early Kalo	78	137	18	7.6	60.5	Early
Wheatland Milo ..	86	142	18	7.1	20.2	Early
Martin	90	136	48	8.3	48.6	Early
Pietersburgh White	98	156	54	18.5	90.7	Late
Atlas*	98	164	60	25.9	not taken	Late
Western Blackhull Kaffir**	103	162	24	not taken	not taken	Late

*Heads well filled but damaged by rain. **Very poorly filled, not worth estimating.

Yield.

Green Fodder.

The best green fodder yields were as follows:—

Late Group—Atlas	25.9 tons Green Material/acre.
Late Group—Pietersburgh White ..	18.5 tons Green Material/acre.
Earlier Group—Martin	8.3 tons Green Material/acre.

Incidentally, the variety Hegarie, the green yields of which were not taken, is known to be more palatable for green fodder than most other grain sorghums.

Grain.

The late types gave the best grain yield—Pietersburgh White yielding 90.7 bushels per acre—but these late varieties are not suitable because of their late maturing and tall growing habits. In the earlier group, yields were still very good being as follows:—

Hegarie	60.5 bushels per acre.
Early Kalo	60.5 bushels per acre.
Martin	48.6 bushels per acre.
Wheatland Milo	20.2 bushels per acre.

Because of its earliness and other desirable characteristics already mentioned, together with its good performance in previous tests, Hegarie is to be preferred above the others, especially as Hegarie germinated relatively poorly as compared with Early Kalo.

Martin yielded similarly to last year, is a modern type, of very good stooling habit and furthermore, was apparently of better vigour (reflected in green fodder yields) than Early Kalo. For these reasons and others, it is suggested that under equal conditions, Martin is better than Early Kalo which has been inconsistent in yields and height in previous trials.

Summary for 1948-49 Trials.

Summing up, it is possible to rank varieties for grain as follows: —

Early to Mid Season	1. Hegarie—alternatively Early Kalo.
Early to Mid Season	2. Martin
Late	3. Pietersburgh White.

Wheatland Milo was disappointing this year, but this is not the Wheatland Milo CR45 strain referred to in previous tests. For green fodder purposes the following were most promising—

Late	1. Atlas.
Late	2. Pietersburgh White.

As a dual purpose variety Martin is suggested.

A variety which could be eliminated from further tests is Western Blackhull Kaffir.

GENERAL SUMMARY GRAIN SORGHUM TRIALS FOR THE YEARS 1946-49.

Grain.

Taking all factors in the 1948-49 trial along with the results of the 1947-48. and the 1946-47 tests into consideration, it would appear that to date the following varieties are the most promising for grain production.

(a) Hegarie has been a relatively early variety in all three tests at Denmark. It fills its heads well; has a moderate but consistent yield, is of quite good growth, and of semi-dwarf habit. Moreover, Hegarie is far more palatable for green fodder than most other grain varieties. Resistance to staining is moderate. In general, Hegarie would appear to be preferable wherever soil moisture supplies are doubtful.

(b) Where higher yields are required, Martin may be desirable. The relative maturity of Martin would appear to vary under our conditions but it could be considered (on the experience of other countries) to be usually earlier than Wheatland and never very much later. A modern American bred variety Martin is semi-dwarf in habit, stools well, is high yielding and is also capable of giving a fair green fodder yield. Where soil moisture is fairly assured or under irrigation, Martin is the logical choice.

(c) Taken on the whole, Wheatland Milo, particularly the CR45 strain has given a moderately good performance in all tests. Mid season in maturity, a fair grain yielder, of desirable dwarf habit, well stooled and of fair resistance to staining, Wheatland Milo is the only variety commercially available for the present so that it must remain as the recommended variety for general use.

(d) Pietersburgh White is late and most probably tall and lank in growth. It has only been tested for one year at Denmark. So despite its high yield and good impression, it cannot be recommended except perhaps for irrigated areas with a long growing season and where mechanical harvesting is not practicable for other reasons.

Thus recommendations can be made as follows:—

Variety	Maturity Group	Purpose
Wheatland	Mid Season	For general planting at the present as seed is readily available commercially.
Hegarie	Very early to early	When seed is available this variety is suggested where soil moisture is limited.
Martin	Early to mid season	When seed is available for general use on areas where the soil moisture is reasonably adequate.

Green Fodder.

Reviewing the last three seasons trials, the following appear to have some possibilities for green fodder purposes as an alternative to grain.

Early—Hegarie—More palatable than Early Kalo.
Early—Early Kalo—For slightly better bulk than Hegarie.
Mid Season—Pink Kaffir.
Late—(1) Atlas.
(2) Pietersburgh White.
(3) Sharron.

Dual Purpose Varieties.

Results of previous tests suggest that the following varieties can be used for green fodder if they fail for grain.

Early —Hegarie
Mid Season—Martin

In conclusion, the number of varieties worth further testing have now been reduced to the point where randomised yield experiments in which full data can be collected are feasible.

DAIRY HERD IMPROVEMENT SCHEME

GRADE HERD RECORDING.

M. CULLITY, Superintendent of Dairying.

THE operations of the Improvement Scheme for 1948-9 show that there is still a keen unsatisfied demand for an extension of Herd Recording. Unfortunately shortage of suitable staff prevented the development which had been planned. Nevertheless the number of cows tested during the year was a record. After excluding those which had not completed 90 days under test 12,692 cows were recorded to have given an average yield of 4810 lb. of milk with 4.47 per cent fat and 214.7 lb. butterfat.

This is 33.1 lb. greater than in the year of resumption of this work (1946-7) when 11,944 cows gave 4200 lb. of milk with 4.36 per cent. fat and 181.6 lb. butterfat.

This represents £4 5s. 6d. increase per cow, at an annual cost of only 3s. 6d. for recording fees. The additional value from the 12,692 cows is £54,258.

Some idea of the extent to which Herd Recording has been accepted as a means of improving yields and general efficiency can be gained from Table 1.

TABLE 1.

GRADE HERD RECORDING.

Year.	Cows in Dairying Areas.	Cows under Test.		Number of Herds Tested.	Number of Units.	Average number of Herds per Unit.	Average number of Cows per Herd.
		Number.	Per cent.				
1933-34 ...	74,900	4,308	5.7	159	8	20	26
1934-35 ...	77,328	4,088	5.2	142	8	18	29
1935-36	76,745	4,590	5.9	178	9	20	26
1936-37 ...	78,547	9,115	11.6	356	18	20	26
1937-38 ...	82,893	10,033	12.1	393	19	21	26
1938-39	85,300	12,368	14.4	485	23	21	26
1939-40	90,169	11,479	12.7	465	23	20	26
1940-41	94,891	9,609	10.1	409	20	20	23
1941-42	98,850	7,081	7.1	301	16	19	24
1946-47 ...	102,256	11,944	11.6	432	21	21	28
1947-48	104,193	12,395	11.8	460	24	19	27
1948-49	107,223	12,692	11.8	477	25	19	27

The season could be considered normal although May of 1949 was unusually dry. The following comparison of rainfall for the year with a 42 years' average for six key stations shows that the seasonal variation was small.

TABLE 2.

COMPARISON OF RAINFALL.

Month.	Points. 1948–49.	Points. Average to 1942.
1948—		
July	941	662
August	670	586
September	480	426
October	211	305
November	214	124
December	128	74
1949—		
January	40	63
February	5	72
March	132	121
April	462	205
May	108	551
June	468	730
	3,859	3,919

The total production of milk for all purposes was only little behind that of the previous year which constituted a record for this State.

Details of production since the commencement of testing in 1933 are shown in Table 3.

In the first year, 1933-4 and again in the year the work was resumed after the war, the average yield was 180 lb. approximately. In other years most new units have given somewhat similar production. It is possible that first year results are depressed somewhat owing to some yields of cows nearing the end of their lactations at the commencement of the testing year. However, the improvement in yields in following years is substantial. The improved results following consistent recording and study of the results by the herd owners may be seen from the following segregation of averages according to the number of years the herds have been under test.

TABLE 3.

AVERAGE PRODUCTION PER COW 1934-48.

Year.	No. of Cows.	Milk (gals.).	Test (per cent).	Butterfat (lb.)
1933–34	4,308	415	4.35	180.60
1937–38	10,033	486	4.59	223.10
1938–39	12,368	487	4.48	218.70
1939–40	11,479	462	4.51	208.30
1940–41	9,609	447	4.45	199.00
1941–42	7,081	496	4.52	224.02
	*5,695	502	4.61	231.78
1946–47	11,944	420	4.36	181.00
1947–48	12,395	478	4.46	213.30
1948–49	12,692	481	4.47	214.71

* Excludes four Units tested for from six to seven months only.

Thus herds which were tested for two years produced 19 lb. fat more than those tested one year only while those which were in the Scheme for three years produced 28 lb. and 9 lb. more respectively than those recorded for one and two years.

TABLE 4.

VALUE OF CONTINUITY OF TESTING.

	Herds.	lb. fat.	
Herds tested one year only—			
1946–47	432	181	
1947–48	210	199	
1948–49	164	199	
Average of	806	189	lb. fat.
Herds tested two successive years—	Herds.	lb. fat.	
1946–48	253	207	
1947–49	131	216	
Average of	384	208	lb. fat.
Herds tested three successive years—	Herds.	lb. fat.	
1946–49	176	217	

The value of this extra production is appreciable as is set out in Table 5 for each cow, and for herds of 20 and 30 cows. The price of butterfat for the period has been taken at 2s. 7d. per pound.

TABLE 5.

———	Margin per cow over one year's testing.	Value at 2s. 7d. per pound.		
		Per cow.	Per 20 cows.	Per 30 cows.
	lb.	£ s. d.	£ s. d.	£ s. d.
Herds tested 3 years	28	3 12 4	72 6 8	108 10 0
Herds tested 2 years	9	1 3 3	23 5 0	34 17 6

The annual cost of fees for the above result is 3s. 6d. per cow, £3 10s. per 20 cows, £4 15s. per 30 cows.

A further indication of the value of continuity of testing from year to year is seen in the performances of the herd of Mr. O. Foan of Donnybrook. The average yield of this herd year by year is as under:—

Year.	No. of Cows.	Average Butterfat.
		lb.
1933–34	14	211
1934–35	20	272
1935–36	18	325
1936–37	21	319
1937–38	19	359
1938–39	19	337
1939–40	18	300
1940–41	14	291
1941–42	14	328
1946–47	24	344
1947–48	20	380
1948–49	21	407

The soil on Mr. Foan's property is recognised in the district as being of poor quality, but by judicious management of the pastures, careful breeding and selection of his herd, and good husbandry, he has achieved consistently high average yields.

Results from the individual units are given in Table 6.

TABLE 6.

PRODUCTION PER COW IN EACH UNIT.

Listed in order of Merit.

Unit.	No. of Herds.	No. of Cows.	*Percentage of Heifers.	Milk Average (lb.)	Test (per cent).	Butterfat Average (lb.).		
						1948–49.	1947–48.	1946–47.
Cowaramup Nth.	19	391	50	5,375	4.7	257.8	244.2	228.0
Rosa Brook	20	467	35	5,368	4.7	255.7	228.7	201.9
Denmark	19	402	16	5,253	4.7	251.6	216.3	191.6
Cowaramup Sth.	19	350	43	5,432	4.4	241.1	252.7	194.9
Waroona	17	541	41	5,226	4.4	230.7	238.6	198.0
Margaret River	17	392	37	5,260	4.3	228.7	196.0	187.4
Brunswick	13	443	37	4,833	4.6	225.2	210.6	181.0
Donnybrook	17	392	32	4,627	4.8	225.2	219.0	193.0
Forest Grove	21	519	38	5,034	4.4	224.8	195.5	163.3
Harvey	16	616	23	5,138	4.3	222.9	255.0	192.0
Northcliffe	22	562	15	4,637	4.7	219.6	177.0	..
Nannup	21	601	26	4,982	4.4	218.3	197.7	170.0
Balingup	20	618	50	4,881	4.4	216.5	213.3	181.5
Albany ...	20	464	46	4,657	4.6	215.2	220.7	166.0
Pinjarra	18	621	29	4,954	4.2	212.1	227.2	184.0
Scotsdale	22	458	60	4,526	4.6	210.8	201.4	..
Ruabon	19	724	35	5,053	4.1	208.9	207.1	201.6
Pemberton	20	438	20	4,757	4.3	207.4	210.6	148.3
Armadale	17	609	12	4,850	4.2	206.2	..	
Mt. Barker	21	611	20	4,536	4.5	197.6	223.8	158.5
Vasse-Jindong	18	572	23	4,369	4.3	189.9	189.1	..
Metricup	16	392	20	4,195	4.4	186.7	190.6	216.7
Manjimup	23	581	15	4,231	4.3	184.0	193.3	167.8
Bridgetown	21	516	38	4,135	4.4	182.8	213.0	167.5
Wilga ...	21	412	44	4,001	4.3	172.8	205.1	162.0

* Including two and three year olds.

The leading unit was that at North Cowaramup where 391 cows had an average yield of 5375 lb. milk at a test of 4.79 per cent. for 257.8 lb. butterfat. This is an improvement of 13.6 lb. of fat from the previous year. In second place is Rosa Brook where 467 cows produced 5,368 lb. of milk 4.75 per cent. test and 255.8 lb. butterfat, which was 27 lb. over 1947-48.

The third unit, Denmark, showed a still greater improvement from the previous year. The increase was 35.3 lb. from 216.3 to 281.6 lb. butterfat. There were 402 cows in the unit for a milk yield of 5,253 lb.

Fourteen of the 25 units were above the average for the year, while five only were below the average (196 lb.) of the farms surveyed by the Joint Dairy Industry Costs Advisory Committee with a view to determining a basis for a recommendation regarding price.

Grouping of herds according to production is shown in Table 7.

The percentage of herds under 200 lb. was 36.8 per cent. compared to 38.6 per cent. and 66.7 per cent. for 1947-8 and 1946-7. In 1933-4 74.5 per cent. of the herds were under this figure. Some improvement is being achieved but more than one third of the herds are below this figure. There still remains considerable room for further concentration on the part of the herd owner to lift the yields of his cows.

TABLE 7.

HERDS GROUPED ACCORDING TO PRODUCTION.

Butterfat per Head (lb.).

Year.	Over 400.	350–400.	300–350.	250–300.	200–250.	150–200.	100–150.	Under 100.
	%	%	%	%	%	%	%	%
1933–34			1.3	3.9	20.3	53.6	18.3	2.6
1939–40	..	..	3.2	18.5	34.6	32.9	9.7	1.1
1940–41	.		1.5	13.9	31.8	39.4	12.7	.8
1941–42		1.6	8.2	21.9	42.1	21.5	4.7	..
1946–47		.	1.2	7.9	25.2	39.9	22.4	3.4
1947–48	...	.6	3.9	18.1	38.8	27.6	10.2	.8
1948–49	.6	.8	5.2	17.6	38.7	28.7	7.3	.8

While there is a noticeable trend towards fewer herds under 200 lb., there is also a movement to more over 300 lb. In 1933-4 only 1.3 per cent. reached this figure. In 1946-7, the first year of resumption after the war, only 1.2 per cent. were in this group. In the following two years, the percentage increased to 4.5 per cent. and 6.6 per cent.

The trend at each end of the scale may be seen from Graph 1.

A similar grouping of both mature cows and heifers (see Table 8 and Graphs 2 and 3) shows a similar trend.

TABLE 8.

COWS GROUPED ACCORDING TO AGE AND PRODUCTION.

(Cows tested less than 90 days excluded.)

Groups according to Butterfat Production (lb.).

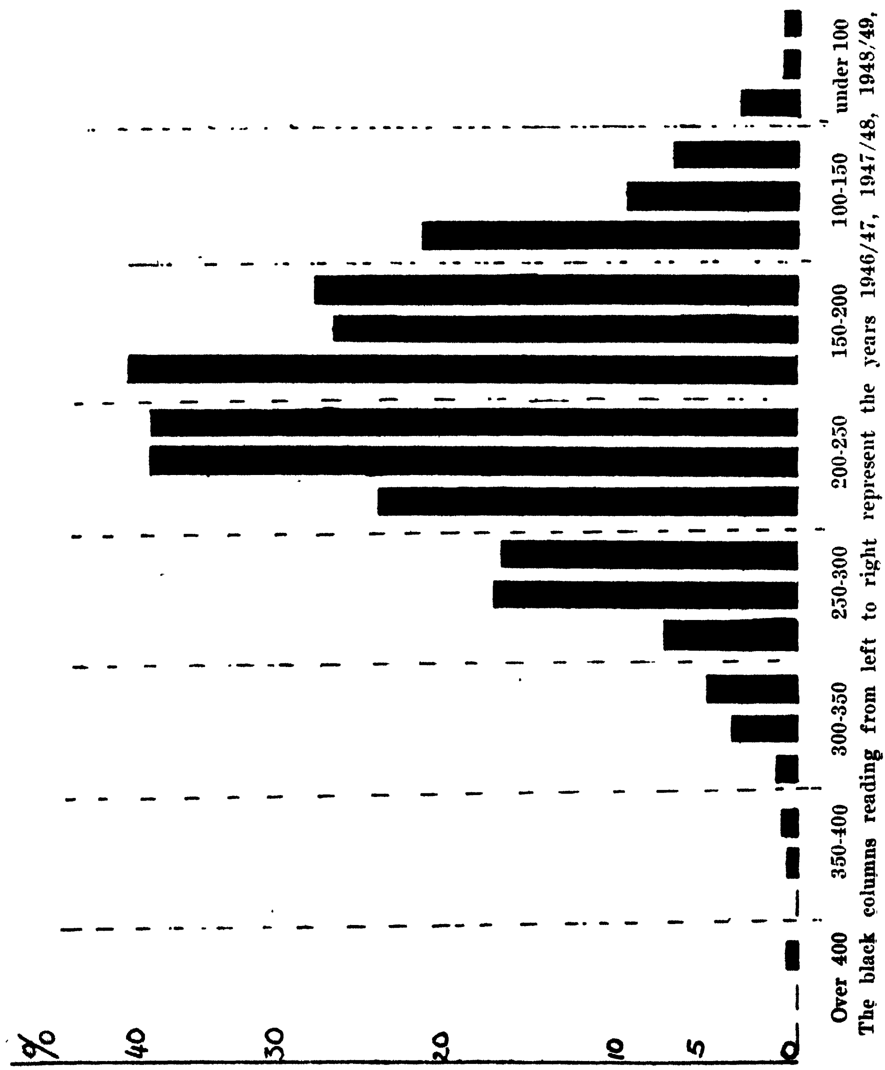
Year.	Age.	Over 600.	500–600.	400–500.	300–400.	200–300.	150–200.	100–150.	Under 100.	Total Cows.
		%	%	%	%	%	%	%	%	
1942	Mat.	0.02	0.3	2.4	21.8	46.4	17.4	8.7	3.0	4,287
1947	„		0.07	0.68	7.97	35.16	26.37	20.13	9.62	8,711
1948	„	0.01	0.1	1.85	14.84	42.11	21.21	13.67	6.21	8,999
1949	„	.03	0.19	2.32	15.42	40.64	21.89	13.14	6.34	8,713
1942	Heifers	.	0.05	0.2	5.8	36.8	27.5	20.2	9.4	1,978
1947	„		..	0.1	3.2	25.5	29.4	25.8	16.0	3,232
1948	„	...	0.05	0.21	7.14	36.42	26.58	19.16	10.44	3,396
1949	„	...	0.02	0.43	6.98	38.80	26.26	18.58	8.99	3,979

One of the disappointing features of Herd Recording is the relatively large number of low yielding cows kept in the herds from year to year. Nearly 20 per cent. of the mature cows and 26 per cent. of the heifers produced less than 150 lb. The rate of culling allows plenty of margin for increase, and it can be suggested

that 200 lb. is a far better minimum for the poorest herd. Farmers must exercise care, however, that low yields are not the result of poor feeding and management and that, on buying new stock to replace culls, only animals of superior quality are purchased.

GRAPH 1.

Herds grouped according to production, butterfat per head (lb.).



Month of Calving and Length of Lactation.

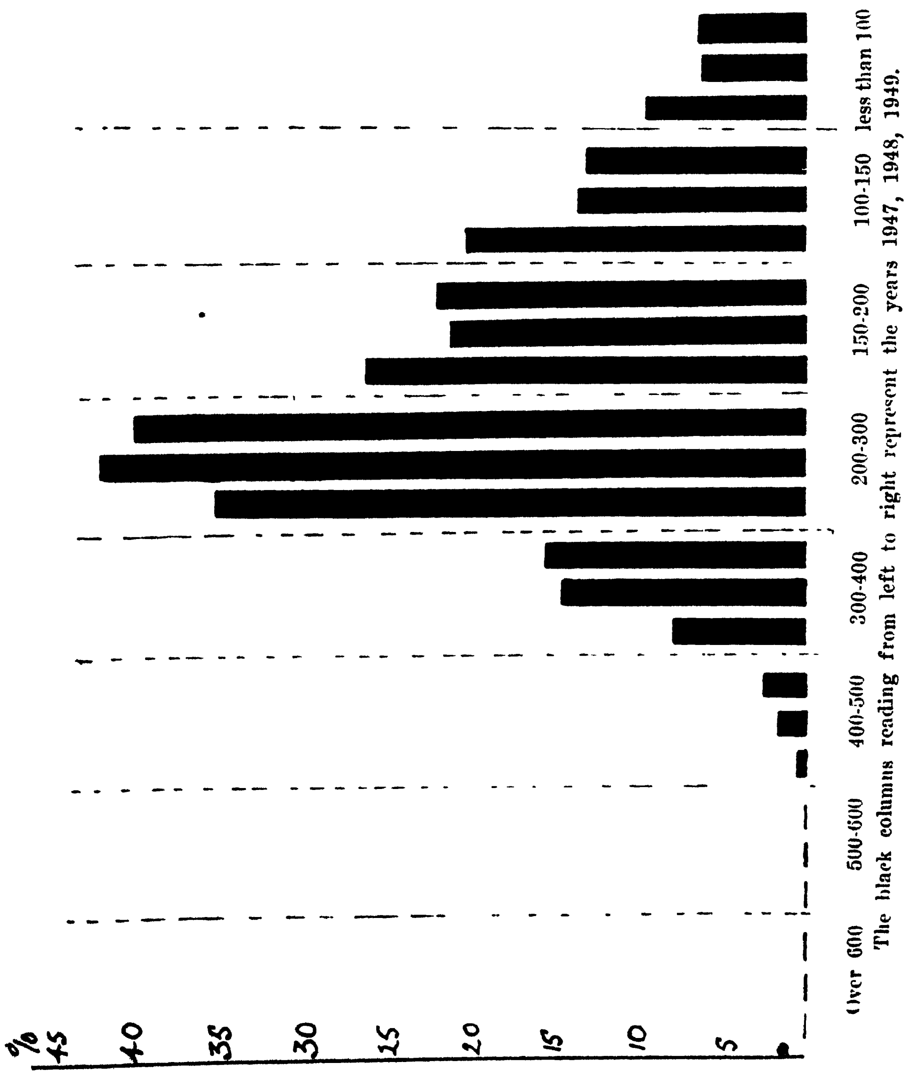
The influence of the month of calving on production is discussed in a separate report. The year's data confirmed that obtained in previous seasons, that those cows calving in March, April, May, June and July produce more than those calving at other times.

Only 26 per cent. of the cows completed 273 days, and these had an average yield of 280.26 lb. fat compared to 214.7 lb. for the whole scheme.

As it appeared obvious that even a large proportion of early calvers were not completing a full period, details of the length of lactation were prepared. The average length for all cows proved to be 6.9 months. Details of this work are given in a separate report.

GRAPH 2.

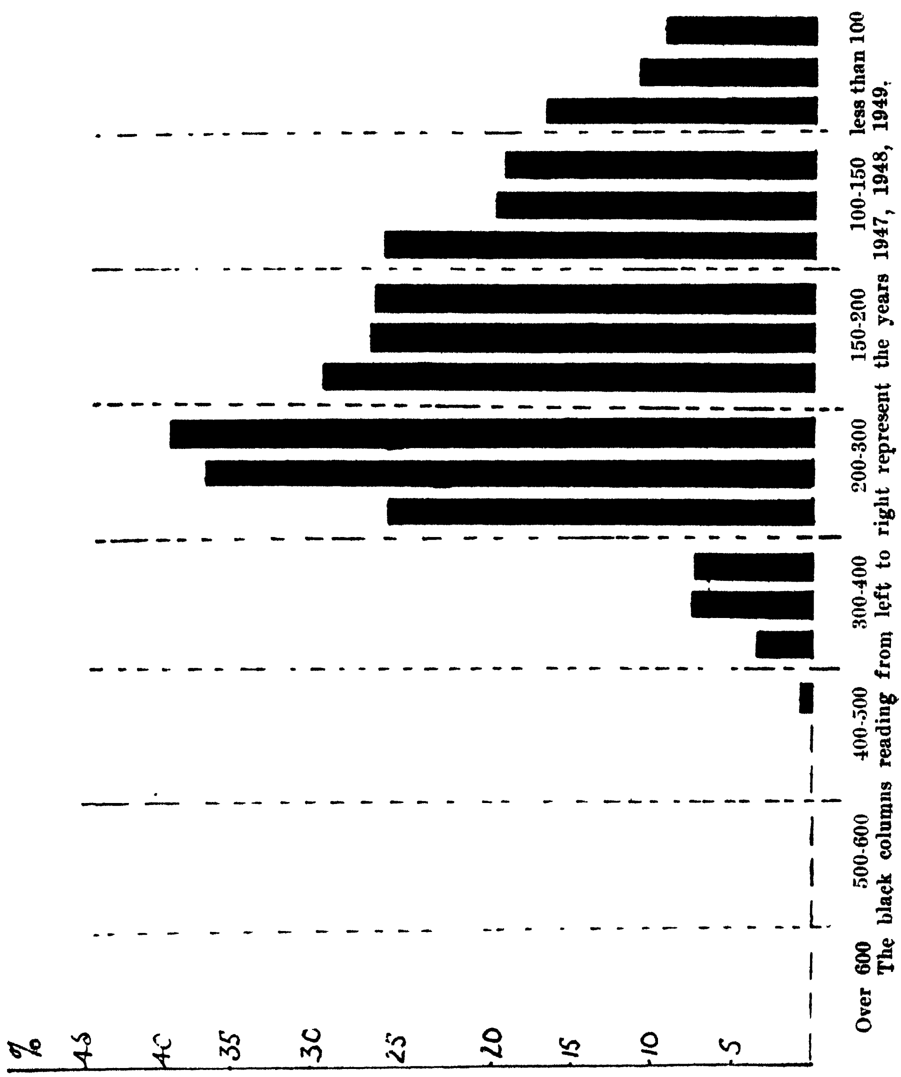
Mature Cows grouped according to production of butter fat (lb.).
(Cows tested less than 90 days excluded.)



GRAPH 3.

Heifers Grouped According to Production of Butterfat (lbs.).

(Heifers tested less than 90 days excluded.)



Herd Wastage.

Details of herd wastage were collected again from all units and are given in Table 9. The total recorded disposals for the year represented 16.9 per cent. of all cows in the units. This figure is considered to be reasonably accurate and arrangements have been made for a complete checking of the data in this section each year. The information collected is intended to indicate the relative degree of losses and the causes in the various units. This will, in some cases at least, assist in directing attention to areas where special problems are occurring.

TABLE 9.

HERD WASTAGE.

Unit.	Unit Letter.	No. of Cows in Unit.			Total Disposals Wastage, etc.	Sold for Dairying Purposes.	A	B	C	D	E	F	G	H	I
								Disease.				Other Causes.			
		A Class.	B Class.	Total Cows.			Low Production.	Udder Troubles Mammitis, etc.	Abortion and Sterility.	T.B.	Other Diseases.	Accident or Injury.	Old Age.	Other Causes.	Sundry Deaths.
Pinjarra	A	650	67	717	264	82	89	27	33	…	4	7	6	10	6
Waroona	B	581	28	609	64	1	26	15	3	6	4	…	1	8	…
Harvey	C	648	55	703	134	4	106	10	1	…	…	…	2	…	11
Brunswick	D	486	20	506	81	6	62	1	4	5	…	1	1	…	1
Ruabon	E	724	6	730	155	41	56	37	13	…	1	…	3	2	2
Metricup	F	433		433	33	1	25	6	…	…	…	…	…	…	1
North Cowaramup	G	391	6	397	87	…	44	18	11	1	2	1	2	7	1
Margaret River	I	396	7	403	67	5	51	6	1	…	…	1	1	…	2
Rosa Brook	J	477		477	88	23	41	4	1	…	1	4	3	8	3
Forest Grove	K	521		521	48	1	22	4	…	…	…	3	1	12	5
Donnybrook	L	419	15	434	31	13	10	1	…	…	…	3	…	…	4
Balingup	M	621		621	124	…	101	…	6	…	…	2	10	3	2
Bridgetown	N	528	62	590	62	…	45	10	…	…	…	…	3	2	2
Manjimup	O	595	46	641	68	3	26	9	17	…	…	3	2	8	…
Pemberton	P	438	…	438	46	5	17	11	…	…	…	3	8	2	…
Wilga	R	445	21	466	151	75	40	8	20	…	…	…	8	…	…
Mt. Barker	S	628	3	631	215	3	169	12	…	9	…	2	1	14	5
Albany	T	478	25	503	111	9	47	37	2	…	…	1	4	3	8
Nannup	U	610	9	619	22	…	7	2	…	…	…	…	…	10	3
Vasse-Jindong	V	623	83	706	71	…	48	5	8	…	…	1	…	9	…
Denmark	W	408	10	418	39	7	2	16	2	…	…	1	7	1	3
Northcliffe	X	590	39	629	102	9	75	1	6	…	…	2	3	3	3
Scotsdale	Y	486	4	490	124	20	86	6	1	4	3	1	…	…	3
Armadale	Z	677	…	677	75	11	31	11	1	17	…	…	…	3	1
Totals		12,853	506	13,359	2,262	319	1,226	257	130	42	15	36	66	105	66
Percentages		96.2	3.8	100	16·9	2·4	9·2	1·9	1·0	0·3	0·1	0·3	0·5	0·8	0·5

Excluding South Cowaramup for which wastage is not available.

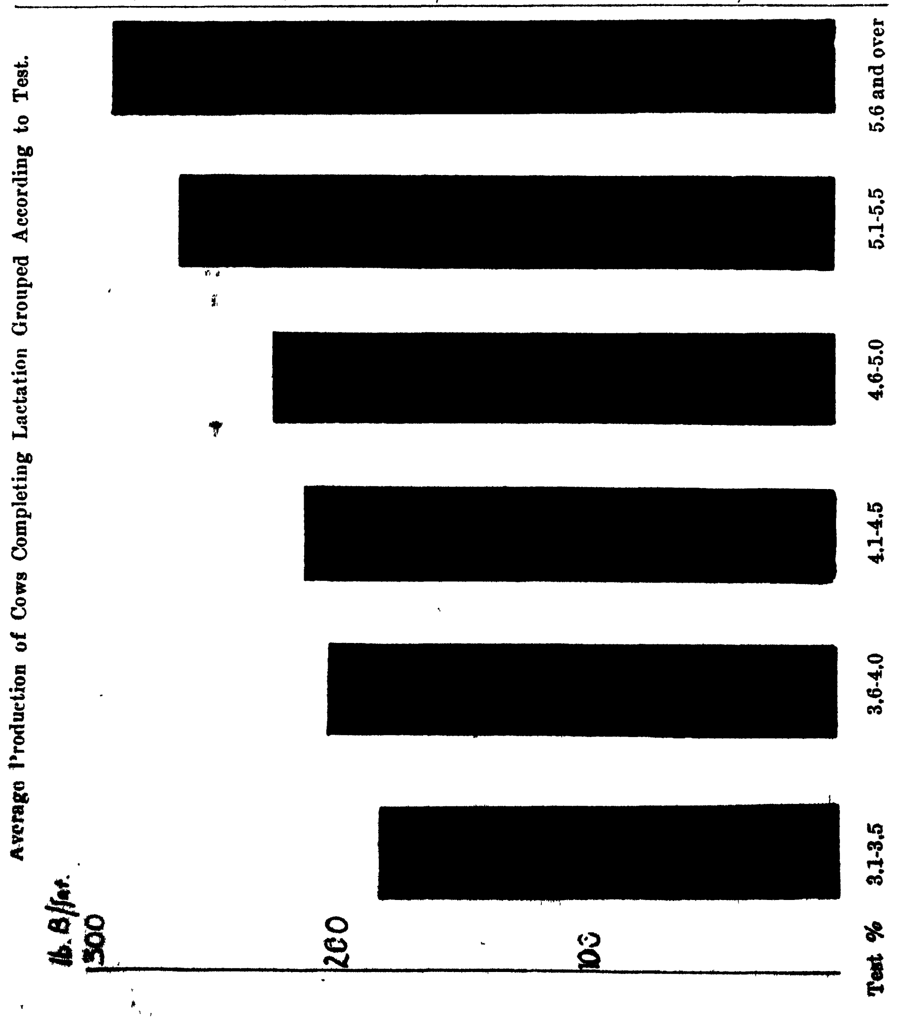
Effect of Test on Average Yields.

The tabulation of four years results of grouping butterfat percentage to indicate any trend in production is given in Table 10. Graph 4 has been prepared also to show the variation in yield according to test.

TABLE 10.

COWS GROUPED ACCORDING TO TEST.
(Including Cows completing lactation only.)
Summary of four years shown.

Test.	No. of Herds.	No. of Cows.	Average Milk	Average Test.	Average Butterfat.
			lb.	%	lb.
3.1-3.5	8	180	5,355.7	3.43	183.72
3.6-4.0	186	4,203	5,130.1	3.93	202.11
4.1-4.5	594	11,425	4,761.9	4.33	206.56
4.6-5.0	467	9,020	4,708.1	4.73	222.69
5.1-5.5	131	2,062	4,893.6	5.43	256.14
5.6 and over	23	246	4,987.4	5.80	289.69



It will be seen that, as for the three years' results published in the last report, average yield rose regularly with the higher groupings of test.

The value of bulls from high testing strains which are capable of transmitting the capacity for high test to their progeny may be readily appreciated. The lifting of a herd average test from 4 per cent. to 5 per cent. without any variation in milk flow is a 25 per cent. increase in butterfat. The capacity for milk yields and butterfat percentage appear to be characters which are inherited separately and therefore for high milk yielding herds, bulls may be selected on the basis of high test, provided intelligent culling of low milk yielding progeny is carried out.

Effect of Breed on Average Yields.

An endeavour was made to segregate information regarding the performances of herds which were largely representative of one breed only.

In the case of the Jersey breed a larger number of herds, composed almost entirely of Jersey animals were available. With the Guernsey and Shorthorn breeds, a higher proportion of crossbred animals were included, but, even so, in these herds a single breed was very predominant.

Table 11 shows the average for each breed for all complete lactations and for a 273-day lactation period only. It will be noted that the Guernseys and Jerseys proved superior to the Shorthorn herds, their average yields being 264, 252 and 217 lb. of butterfat respectively. The average yields of milk of the Guernseys and Shorthorns were similar. The yield of milk by the Jersey cows was slightly lower. Probably the most interesting feature of this table is the proportion of the various breeds which achieved a full 273-day lactation. The Guernsey herds were best with 62.5 per cent. followed by the Jerseys with 51.2 per cent. The proportion of full lactations by Shorthorns was low, with 29.1 per cent. only.

TABLE 11.

RELATIVE YIELDS OF VARIOUS BREEDS.

Breed.	No. of Herds.	Complete Lactations.					273-Day Lactations.					Percentage Lactations reaching 273 days.
		No. of Cows.	Average.				No. of Cows	Average.				
			No. of Cows per Herd.	Milk per Cow.	Fat per Cow.	Fat.		No. of Cows per Herd.	Milk per Cow.	Fat per Cow.	Fat.	
				lb.	lb.	%			lb.	lb.	%	
Jersey	35	778	22 2	5,066.9	252 1	4.96	398	11 4	5,909.8	294.8	4 99	51.2
Guernsey	23	427	18.6	5,355 6	264 5	4 94	267	11 6	5,952.4	296.6	5 02	62.5
A.I.S. ..	25	774	31.0	5,351.3	217.7	4.07	225	9 0	6.654 0	276 5	4.15	29.1

It is impossible at this stage to understand the significance of these figures. They provide, however, a basis for further investigation in future years.

Calf Marking.

Marking of calves from A Class cows has been continued as a basis for sire surveys. The number of calves marked during the year showed a substantial increase.

Proved Bulls.

As in last year's report, details of the performances of the daughters of bulls in tested herds are given, Table 12.

TABLE 12.

Bulls with Six or More Daughters Completing Lactation.

Bull.	Breed.	Daughters. 2 Years Old. No.	2 Years Old. Butter-fat Average.	3 Years Old. No.	3 Years Old. Butter-fat Average.	4 Years Old. No.	4 Years Old. Butter-fat Average.	Mature. No.	Mature. Butter-fat Average.	Total. No.	Total. Butter-fat Average.	Unit.	Owner.	Age of Bull.
			lb.		lb.		lb.		lb.		lb.			
Crantock Napoleon's Masterpiece	Jersey	....	....	....	....	1	430.63	6	484.35	7	476.67	Denmark	W. Middleton	13
Eastbrook Tribute	Guernsey	...	....	....	....		...	12	401.62	12	401.62	Pemberton	D. Della	Dead
Koojan Monogram	do.	...	...	....	....	..	..	8	399.04	8	399.04	do.	G. H. Barnsby	12
Denmark Ace's Image	do.	4	352.23	...		1	565.28	1	393.31	6	394.59	Scotsdale	W. J. Smith	6
Mureek Paladin	do.	....	....	2	327.00	2	368.50	4	367.00	8	357.00	Rosa Brook	H. & T. Harrison	9
Lansdowne Ace V.	do.		...	2	385.08			4	317.14	6	339.78	Pemberton	D. Della	Dead
Namder Prince	Jersey	2	283.15	4	328.84	1	337.52	2	370.16	9	329 40	Denmark	H. S. Redman	7
Mureek Justice	Guernsey		...	..	...			9	321.00	9	321 00	Rosa Brook	H. & T. Harrison	Dead
Drakesbrook Benefactor	do.	..		....		2	344.50	7	310.85	9	318.33	Harvey	A. R. Testar	14?
The Towers Empire Prince	Jersey	2	358.51	7	341.31	6	236.19	10	303.73	25	315.75	Donnybrook	R. Benson	Dead
Ardgraier Sir Elon	do.		...	6	310 00			...	...	6	310.00	Pinjarra	H. Skidmore	Dead
Korijekup Royal Star	do.	..	....	6	293.50	1	367.00	7	312.57	14	308.29	Harvey	A. G. Eckersley	..
Radar Park September Lad	do.	7	295.00			....	....	2	354.00	9	308 00	do.	L. M. Temple	6
Summerlea Roland	A.I.S.	1	314.00	1	121.00			6	333.83	8	304 75	Margaret River	C. B. Fennell	...
Denmark Dawn's Goldseeker	Guernsey	10	257.20	3	286.33	5	308.80	10	339.40	28	299.00	Albany	Farr Bros.	10
Werribie Davis	Jersey	..	..	5	303.33			1	271.00	6	297.83	Denmark	J. W. Middleton	10
Leylands Foch	A.I.S.							16	297.35	16	297.35	Waroona	H. J. Mullins	15?
Summerlea Peter	do.	..	...					7	297.00	7	297.00	S. Cowaramup	A. W. Dempster	Dead
Avon Court Magnet	do.		....					10	294 86	10	294.86	Ruabon	H. W. Semmens & Son	....
Koojan Banker	Guernsey		..		..	3	288.00	6	290 00	9	289.44	Albany	C. J. Jarrat & A. Bracknell	Dead
Column Mount Rose	Jersey		...	3	239.00	5	318.00	....	...	8	288.62	N. Cowaramup	G. Penfold	Dead
Westby Commander	A.I.S.	4	263.37	2	240.34	5	292.25	12	330.92	23	288.50	Denmark	F. C. Smith	
Walgett Ruby's Nobel	Jersey	...		3	296.00	9	308.00	6	256 00	18	287.00	Nannup	S. C. Maidment	Dead
Lansdowne Ferdinand	Guernsey	...	..	6	259.33	2	282.00	9	313.00	17	285.70	Forest Grove	J. H. Oldfield	Dead
Colmyn Golden III.	Jersey			...	..			17	285.60	17	285.60	Metricup	A. S. Mutimer	11
Wooroloo Nobel II.	A.I.S.			11	253.00	9	291.00	9	318.00	29	285.00	Harvey	S. Fry	Dead
Murray Glen Lord Avon	Friesian		...	9	301.00	9	259.00	13	284.00	31	282 00	do.	F. Byrd	Dead
Victoria Robin Hood	Red Poll	...		5	292.00		..	1	232.00	6	282.00	Mt. Barker	F. R. H. Pugh & Son	13
Longridge Redman	A.I.S.	..		2	229.00	6	249.50	21	291.57	29	278 00	Pinjarra	S. Mullins	Dead
Norinya Nimble	Jersey			2	242.50	1	191.00	9	295.11	12	277.67	Harvey	A. Stanford	10
Plenarbor Master	A.I.S.	..	..	1	304.00	5	266.00	6	275.00	12	274.00	Pinjarra	S. Mullins	8
Grassvale Design's Ruler	Jersey	10	206.00	10	278.00	4	294.00	19	303.00	43	274.00	Donnybrook	E. W. M. Trigwell	12
Rosella Commander	Guernsey	5	239.00	9	280.00	3	296 00			17	271 00	Rosa Brook	T. F. Busby	7
Koojan Ideal Excelsior	Guernsey	8	241.25	4	308.25	1	333.00	1	283.00	14	269.21	Forest Grove	E. G. Noakes	8
Plenarbor Barney	A.I.S.			8	263.37	8	269.62	1	269.00	17	266.47	Waroona	H. J. Mullins	8
Uplands Gray Lad	....	...	....	..	...	3	244.83	14	269.99	17	265.43	Pemberton	A. J. S. Angel	Dead

Colmyn Snowflake Chief	Jersey	..			..	1	316.00	5	253.60	6	264.00	Rosa Brook	G. Crosier & Son ...	Dead
Muresk Jerome	Guernsey	..		1	251.00	2	251.50	3	276.33	6	263.88	Wilga	J. S. Charteris ...	....
Brookfield Bulwark ..	do.	3	191.00	6	288.00	3	336.00	1	200.00	13	262.00	Albany ..	L. Jordan ...	9
Bungella Golden Starbright	Jersey	9	265.00	2	223.00	1	296 00			12	261.00	Pinjarra	T. Abbott	Dead
Moorelands Julian	do.	...						7	259.80	7	259.80	Pemberton	J. J. Littlefair ...	15?
Brackenhurst Gibson Champagne II.	A.I.S.	..		10	252.00	3	269.00	14	260.00	27	258.00	Nannup	S. C. Maidment	13
Barrowdale Lucky Lad	Jersey	5	213.60	4	260 25	3	312.00			12	253.75	Albany ...	Hawley Bros.	8
Killara Merry Chief	do.			3	230.66	4	262.50			7	249 00	Nannup ..	D. Cole	...
Melbury Chief ...	A.I.S.							10	247.00	10	247.00	Margaret River	J. A. Nilsson	Dead
Hopelands Golden Boy	Jersey	11	242.63	1	293.00			1	222.00	13	244.62	Nannup ..	V. Knapton	5
Drakesbrook Kingfisher	Guernsey	4	226.25	3	264.66	2	263 00	2	232.00	11	244.46	Harvey	A. R. Testar ...	14
Muresk Pathfinder	do.					1	191.00	5	255 00	6	244.00	Rosabrook ..	T. F. Busby	13
Rosella Warrior ..	do.	4	217.35	1	306 00	2	263 50			7	243.14	Margaret River	F. Tarchini	7
Capel Rosemary's Commodore	A.I.S.			1	191 00	1	206 00	11	249.00	13	241 15	Forest Grove	A. Rocchi	Dead
Lansdowne Lancelot ...	Guernsey							6	239.83	6	239.83	Pinjarra	B. Nancarrow	Dead
Rosella Majesty	do.	3	150.33	2	262.50	1	220 00	5	286.60	11	239 00	Margaret River	P. Jones	10
Croxton Commander	A.I.S.	2	208.29	2	244.68	2	177.72	2	327.29	8	238.98	Pemberton	J. J. Littlefair	...
Koojan Beau Geste	Guernsey	6	210.67	1	342.00			1	301.00	8	238.37	Balingup	J. A. Dowrick	10
Denmark Rose's Viscount	do.			1	204.00	3	250.00	14	236.00	18	237.00	Northcliffe	J. R. Danbury ...	13
Cleeve Avon Cobber	Friesian	5	258.00	1	81.00	1	227.00	3	254.00	10	236.40	Harvey	F. Byrd	Dead
Congelin Eminent Mariner	Jersey			1	182.00	6	244.00	3	258.00	10	236 00	Metricup	C. R. Irvine	7
Drakesbrook Valour	Guernsey	7	235.14							7	235.14	Waroona	E. Marston ...	7
Juadine Captain	Jersey			3	260.66	2	346.00	3	134 66	8	234 75	Harvey	A. G. Eckersley ...	....
San Soucci Double Success	do.			..		1	217.00	8	233 00	9	231 00	Pemberton ...	H. Styles ..	14?
Woodsome Royal	Red Poll	27	233.80	4	208.50					31	230 52	Waroona	J. Saferian	Dead
Grantham Easter King	Jersey							9	230.22	9	230 22	Forest Grove	W. P. Morris	
Ilginup Evans Pietro	A.I.S.	9	229.64							9	229.64	Ruabon ..	J. Torrent	5
Dunmore David	Friesian			5	241.00	8	218.00			13	227.00	Nannup	V. Scott	9
Westby Grenadier	A.I.S.	1	210 00	7	241.00	3	233 00	14	220.00	25	227 00	Denmark ...	H. M. Bidwell	10
Wonga Park Patsy	Red Poll	8	226 47							8	226.47	Mt. Barker	F. R. H. Pugh & Son	..
Sabina Vale Velvet Boy	Jersey					2	318.00	11	207.00	13	224.00	Nannup	A. Pollock ...	Dead
Rocky Glen Captain ..	A.I.S.					1	174.00	5	234 00	6	224.00	Albany	F. Pease ...	Dead
Brookfield Bachelor	Guernsey	3	169.00	4	204.00	1	239.00	16	235.00	24	222.00	Margaret River	W. B. Wickham	13
Muresk Jeremy	Guernsey	3	165.00	4	234.00	1	235.00	3	250.00	11	220.00	Wilga	R. Charteris	9
Juadine Northward Beau	Jersey	7	219.00							7	219 00	Balingup	F. J. Smith ..	8
Braeside Robin	A.I.S.					1	271 93	8	211.49	9	218.21	Pemberton	B. A. Rice ..	10
Ilginup Monarch Loyalist ..	A.I.S.	7	196.00	4	245 00	1	253 00	..		12	217.00	Waroona	L. Windus ..	9
Wooroloo Rosy III. Guardian	A.I.S.	....				4	182 23	3	258.47	7	214.90	Pemberton	W. Hamilton ...	
Grantham Forward March	Jersey	7	172 00	6	247.00	3	206 00	4	206.00	20	207.00	Waroona	J. Bowles & Son	Dead
Summerlea Peer	A.I.S.			1	123 00	2	138 00	15	226.00	18	205.00	Ruabon	F. L. Torrent ..	Dead
San Soucci Prince Winston	Jersey	4	217.00	1	188.00	5	226.00	7	182.00	17	204.00	Pemberton	H. Styles	Dead
Brackenhurst Reward	A.I.S.	4	164.00	4	218.00	5	243.40	11	191.72	24	202.21	Margaret River	W. & J. George	
Travalgan Rajah	Jersey	11	205 00					3	189.00	14	202.00	Wilga	Runciman & Inglis	Dead
Greenmount Silver King	do.			2	182 00	1	101.00	6	224.00	9	201.00	Donnybrook	Mrs. M. A. Crute	Dead
Glanavon Elder	A.I.S.	8	175 40	3	263 75					11	199.49	do.	M. C. Fry & Sons	6
Greenmount Masterpiece	Jersey	2	205.50	6	168.00			4	237.25	12	197.25	Forest Grove	W. P. Morris	
Clovelly Leo ..	Guernsey			6	194.49					6	194.49	Pemberton	B. A. Rice	8
Brookfield Hopeful	do.							8	194 00	8	194.00	Harvey	A. F. Dean ..	
Claremont Toby	A.I.S.	3	185.00	2	201.00	1	202.00			6	193.16	Balingup	D. Scott ..	Dead
Greenfields Prince	Guernsey	3	158.66	1	210.00	4	208.50			8	190.00	do.	H. H. Daniels	7
Summerlea Starlight	A.I.S.					2	180.00	4	195.75	6	190 00	Rosa Brook	E. A. McSwain	Dead
Summerlea Bruce ..	do.	8	170.24	8	196.32	2	282.23			18	189 31	Mt. Barker	L. Faulkner & Son	
Yokanup Ace	do.	9	163.91	1	225.30					10	188.05	do.	Cluett & Son	6
Royal General ...	Red Poll	7	187.21							7	187.21	do.	A. C. Townsend	

TABLE 12—*continued.*

Bulls with Six or More Daughters Completing Lactation—*continued.*

Bull.	Breed.	Daughters. 2 years Old. No.	2 years Old. Butter-fat Average.	3 years Old. No.	3 years Old. Butter-fat Average.	4 years Old. No.	4 years Old. Butter-fat Average.	Mature. No.	Mature. Butter-fat Average.	Total. No.	Total. Butter-fat Average.	Unit.	Owner.	Age of Bull.
			lb.		lb.		lb.		lb.		lb.			
Brookfields Bugler	Guernsey	5	186.20	5	188.00	4	175.00	9	186.32	23	184.83	Harvey	M. Risbey	9
Clovelly Golden Treasure	do.			11	182.70			1	179.00	12	182 00	Nannup	S. Grimes	6
Many Peaks Corporal	Red Poll	4	161.50		..	1	153.00	1	283.00	6	180.33	Albany	F. Pease	.
Glanavon Ember	A.I.S.	8	169.50	4	198.50					12	179.16	Wilga	C. D. Brown	6
Denmark Golden Nimrod	Guernsey	1	150 30	4	164.59	1	219.00	4	186.88	10	177.45	Denmark	J. Richardson	10
Grass Vale Golden Lad	Jersey							15	177.00	15	177.00	Vasse-Jindong	Badford Park Co.	8
Grass Vale Havelock	do.	1	148.00	.				12	179.00	13	176.84	do.	do. do.	4
Parkview Ullrys Commodore	A.I.S.	11	176.23	.				.		11	176.23	Mt. Barker	C. H. Bailey	....
Basildene Charlie	do.	7	169.14	1	211.00	6	216.16	1	171.00	15	172.50	Margaret River	W. B. Wickham	..
Yokanup Chief	do.	6	160.01		...					6	160.01	Mt. Barker	W. W. Fellows	..
Hilton Strategist IV.	Red Poll	6	124.16	5	197.20			1	107 00	12	153.16	Forest Grove	H. E. Gale	7
Dunmore Judster	Friesian	3	156.00		...			3	150 00	6	153.00	Nannup	J. Gale	..
Glanavon Mozart	A.I.S.	4	143.50	1	163.00	1	175.00			6	152.00	Forest Grove	A. Rocchi	6
Brookfields Bengal	Guernsey	5	140.80	1	128.00	4	147.75			10	142 30	Harvey	G. W. & H. C. Robinson	Dead
Glanavon Edison	A.I.S	9	135.84		.					9	135 84	Mt. Barker	H. McClure & Son	...

The averages are simple for all daughters with a minimum of six. The number and the average yields for the various age classes are also given.

As previously, the disappointing feature is the number of high quality bulls which are already dead. The old slogan of Breed, Feed and Weed, is still applicable to dairy farming. Emphasis must be placed on the "Breed" or quality of the cow, as no matter how much good feed or how efficient the management, yields cannot be greater than the limit imposed by inheritance. It has been shown that the rate of improvement achieved by the selection of the best daughters from the best cows by good bulls is slow. In many cases where wastage is high it is not a means of improvement but simply one of preventing deterioration.

As the quality of herds improves so this method approaches its limit of usefulness and the bull proved to transmit producing capacity becomes the only one which is capable of getting higher yields.

Hence the information regarding actual performance is given for the sires of the cows under test, to assist farmers, who are urgently advised to try and procure herd sires with performances of note.

Rate of Milking.

Investigations into the rate of milking with machines were reported in an earlier issue of this Journal (XXVI, No. 2, pp. 99-100). The data is being collected again this year.

The investigation showed that the rate at which the cows passed through the bails varied with the size of machines. The longer times being recorded with the larger machines as follows:—

2 Unit Machines	7.2 minutes per cow.
3 Unit Machines	7.8 minutes per cow.
4 Unit Machines	9.3 minutes per cow.
5 Unit Machines	11.0 minutes per cow.
6 Unit Machines	11.2 minutes per cow.

The value of the lost time compared to a reasonable period of five minutes per cow, was calculated. For a 30 cow herd on a four unit machine it was shown to be £111.

The need for care in organising shed routine to eliminate waste of time was emphasised.

Co-operative Dairy Farmers' Trophy.

These trophies are at present the only awards in grade Herd Recording. They are given as follows:—

First Year of Testing: The herd with the highest average yield of butter-fat.

Second Year of Testing: The herd showing the greatest improvement in average yield over two years.

Third Year of Testing: The herd showing the greatest improvement in average yield over three years.

To assess the improvement a scale of points was adopted with a bias to the higher averages.

Details for the year 1948-9 are given in Table 13.

TABLE 13.

THE CO-OPERATIVE DAIRY FARMERS' TROPHY.

Owner.	Unit.	Average Butterfat Production (lb.).		Points Scored.
		1947–48.	1948–49.	
W. Middleton	Denmark	348	419	85.20
G. Barnsby	Pemberton	359	395	43.20
D. G. Spark	Pinjarra	333	366	39.60
Sanders & Son	Northcliffe	173	328	38.75
O. Foan	Donnybrook	380	407	35.10
J. White	Rosa Brook	179	319	35.00
H. Pickering	Margaret River	95	231	27.20
G. V. Crooke	Cowaramup, South	379	399	26.00
E. G. Noakes	Forest Grove	202	292	25.71
C. Carver	Harvey	249	336	24.85
T. H. M. Lefroy	Cowaramup, North	303	326	23.00
J. J. Joyce	Albany	217	292	21.42
C. E. Jackson	Brunswick	218	291	20.81
A. R. Rodgers	Scotsdale	136	240	20.80
D. Colum	Waroona	251	310	19.60
A. D. Jones	Manjimup	178	252	18.50
T. K. Daley	Vasse-Jindong	139	211	14.40
A. L. Lee	Balingup	185	242	14.25
D. Cole	Nannup	183	234	12.75
J. Thompson	Wilga	183	227	11.00
J. Hart	Metricup	239	269	8.57
H. J. Shepherd	Mt. Barker	206	222	4.57
L. P. J. Reilly	Ruabon	188	205	4.25
H. Pearce	Bridgetown	189	191	1.00

Leading Herds.

The performances of the leading herds of various sizes are given in the following Tables 14, 15, 16 and 17.

TABLE 14.

LEADING HERDS OF LESS THAN 20 COWS.

Name of Owner.	Unit.	No. of Cows.	Breed.	Butterfat Average (lb.)
Middleton, W.	Denmark	19	Jersey	418·92
Smith, W. J.	Scotsdale	14	Guernsey	411.19
Barnsby, G. H.	Pemberton	15	Guernsey	394.67
Spark, D. G.	Pinjarra	19	Jersey	365.63
Boardman, F.	Ruabon	10	Guernsey-A.I.S. X	338.22
White, J.	Rosa Brook	12	A.I.S.	318.83
Larsen, F.	Cowaramup, North	19	Mixed	318.76
Pate, G.	Denmark	17	Mixed	318·22
Ward, G.	Cowaramup, South	14	Guernsey	318.00
Smith, R.	Northcliffe	13	Jersey	316.80
Stephens, J. T.	Scotsdale	18	Mixed	312.84

Table 14—*continued.*

Name of Owner.	Unit.	No. of Cows.	Breed.	Butterfat Average (lb.)
Crute, Mrs., M. A.	Donnybrook	14	Jersey	310.79
Redman, H. S.	Denmark	18	Jersey	309.99
Layman, G.	Donnybrook	6	Jersey and A.I.S.	306.91
Barry, J. M.	Scotsdale	12	Jersey-Shorthorn X	304.26
Maxwell, A.	Rosa Brook	14	Mixed	300.49
Henderson, R. J.	Rosa Brook	18	Mixed	296.57
Temple, L. M.	Harvey	19	Jersey Friesian X	293.58
Morgan, B. I.	Manjimup	14	Mixed	293.50
Joyce, J. J.	Albany	15	Mixed	292.33
Jarvis, J.	Donnybrook	18	Mixed	291.73
Robinson, W. A. and M. E.	Cowaramup, North	12	Mixed	290.77
Blight, R.	Denmark	12	Guernsey	285·92
West, S. and M.	Rosa Brook	12	Jersey	281.87
Hawkesford, H.	Cowaramup, North	13	Mixed	280.91
Bignell, E.	Cowaramup, North	15	Mixed	272.77
Hunwick, R. J.	Forest Grove	18	Jersey	271.83
Doak, F.	Rosa Brook	16	Mixed	270.80
Jackman, L. A.	Armadale	16	Friesian X	270.68
Hansen, E. A.	Margaret River	16	Mixed	270.37
McLaren, W. J.	Albany	15	Guernsey and Shorthorn	269.67
Streatfield, E.	Margaret River	9	Shorthorn and Jersey X	267.00
Bushby, J. L.	Forest Grove	13	Mixed	262.07
DeCampo, L.	Pemberton	18	Shorthorn X	261.44
Brenton, S.	Denmark	17	Guernsey and Jersey X	260·11
Holben, W.	Cowaramup, South	17	Mixed	259.60
Gregson, R. W.	Forest Grove	19	Guernsey	259.47
Oregione, E.	Manjimup	11	Mixed	256.30
Shepherd, J. O.	Manjimup	14	Mixed	256.00
Moran, J. and F.	Albany	12	Guernsey and Shorthorn	255.75
McLaren, J.	Forest Grove	18	Mixed	255.11
Palfrey, A. G.	Pemberton	10	Mixed	253.30
Brenton, G.	Denmark	5	Guernsey	252·01
Jones, A. D.	Manjimup	13	Mixed	252.00
Parker, G. S.	Cowaramup, South	16	Mixed	251.43
George, W.	Margaret River	15	Jersey and Shorthorn	251.00

TABLE 15.

LEADING HERDS OF 20 TO 30 COWS.

Name of Owner.	Unit.	No. of Cows.	Breed.	Butterfat Average (lb.)
Foan, O.	Donnybrook	21	Jersey	407.41
Crooke, G. V.	Cowaramup, South	20	Jersey X	398.75
Della, D.	Pemberton	24	Guernsey	364.94
Heathcote, C. and V.	Northcliffe	25	Mixed	336.60
Carver, C.	Harvey	22	Mixed	336.09
Sanders & Son	Northcliffe	25	Mixed	327·80
Lefroy, T. H. M.	Cowaramup, North	27	Mixed	325.95
Jackson, T. W.	Waroona	27	Mixed	319.30
Harrison, H. & T.	Rosa Brook	30	Mixed	313.87
Brennan, M.	Balingup	28	Guernsey and Jersey	312.00
Dowrick, J. A.	Balingup	30	Mixed	310.86
Fennell, C. B.	Margaret River	22	Shorthorn and Jersey	305.54
Riising, K.	Northcliffe	21	Mixed	301.00

Table 15—*continued.*

Name of Owner.	Unit.	No. of Cows.	Breed.	Butterfat Average lb.
Plozza, C. W.	Denmark	26	Jersey-Shorthorn X	300.00
Colum, P. J.	Waroona	28	Shorthorn-Jersey X	299.79
Abbott, T.	Pinjarra	20	Jersey	299.20
Gibbs, A. L.	Cowaramup, North	23	Mixed	294.74
Hick, E. F.	Scotsdale	21	Jersey	292.48
Stirling, N.	Margaret River	20	Jersey X	292·30
Webster, W.	Cowaramup, North	22	Shorthorn-Jersey X	288.85
Lang, A. R.	Margaret River	29	Mixed	285.62
Beckett, K. G.	Metricup	29	Jersey X Shorthorn	283.31
Palmer, R. K.	Cowaramup, North	22	Jersey X Shorthorn	283.18
Silvester, H.	Cowaramup, South	20	Mixed	269.80
Hart, J.	Metricup	23	Mixed	269·39
Testar, A. R.	Harvey	27	Guernsey	268·78
Duggan, W.	Cowaramup, North	20	Mixed	266.60
Scott, V.	Nannup	29	Friesian	265.30
Robinson, A.	Waroona	21	Mixed	264.71
Mutimer, A. S.	Metricup	25	Jersey	264.16
Allwood, F.	Albany	27	Guernsey	264.11
Marshall, N. E.	Scotsdale	24	Guernsey	259.08
Hortin, F. V.	Albany	26	Mixed	258·88
Moyes, H. S. and P. D.	Bridgetown	29	Shorthorn	256.72
Wetherly, L. M.	Ruabon	25	A.I.S.	256.49
George, T. B.	Cowaramup, North	26	Jersey	254.96
Becker, C.	Cowaramup, North	24	Mixed	251.42
Puls Bros.	Albany	28	Mixed	250.61
Dennis, F.	Rosa Brook	29	Mixed	250.34

TABLE 16.

LEADING HERDS OF 31 TO 50 COWS.

Name of Owner.	Unit.	No. of Cows.	Breed.	Butterfat Average lb.
Benson, R.	Donnybrook	31	Jersey	309·98
Noakes, E. G.	Forest Grove	38	Mixed	292.44
Langley, A. W. and W. L.	Cowaramup, South	42	Shorthorn and A.I.S.	290.90
Jackson, C. E.	Brunswick	36	Jersey	290.72
Trigwell, E. W. M.	Donnybrook	34	Jersey	290·35
Cunningham, A. W.	Armadale	50	Friesian	288·16
Farr Bros.	Albany	46	Guernsey and Shorthorn	286.83
Smith, F.	Denmark	31	Mixed	285·86
Gilmour, J. (Jr.)	Brunswick	37	Guernsey	278.76
McNeil, H. H.	Waroona	41	Shorthorn X	278.34
Reading, R. P.	Vasse-Jindong	42	Mixed	274.21
Blomfield, B.	Armadale	31	Red Poll and Guernsey	271.61
Edwards, P. J.	Brunswick	39	Mixed	267.46
Glendon, J. E.	Ruabon	41	A.I.S.	266.39
Mullins, H. J.	Waroona	45	A.I.S.	266.22
Oldfield, J. H.	Forest Grove	39	Mixed	265.74
Smith, F.	Balingup	32	Jersey	262.84
Arthur, E. J.	Rosa Brook	46	Mixed	260.91
Angell, J.	Rosa Brook	34	Jersey	258.80
Wood, W. J.	Rosa Brook	36	Mixed	257.50
Chapman, K.	Wilga	31	Mixed	257.40
Bashford, J.	Northcliffe	33	Mixed	255.50
Busby, T.	Rosa Brook	39	Guernsey	252.19

TABLE 17.

LEADING HERDS OF 51 COWS OR MORE.

Name of Owner.	Unit.	No. of Cows.	Breed.	Butterfat Average lb.
Bassett Scarfe Bros.	Armadale	102	Mixed	287·49
Knapton, V.	Nannup	53	Jersey	286.30
Semmens, H. W.	Ruabon	55	Jersey	279.40
Pugh, F. R. H.	Mt. Barker	57	Mixed	275.55
Beacham, R.	Pinjarra	51	Mixed	265.92
Maidment, S. C.	Nannup	57	Mixed	258.20
Mullins, S.	Pinjarra	72	A.I.S.	242.95
Fry, S.	Harvey	68	Shorthorn and Friesian X	231.10
Salerian, J.	Waroona	82	Red Poll and Jersey	219.57
Stewart, G. A.	Brunswick	62	Mixed	205.55
Grimes, S.	Nannup	52	Guernsey and Jersey	202.50

Highest Producing Cows in Each Unit.

The leading cows in each unit with their yields are named in Table 18.

TABLE 18.

THE HIGHEST PRODUCING COW IN EACH UNIT.

Name of Owner.	Unit.	Name of Cow.	Breed.	Milk.	Test.	Butter-fat.
				lb.	%	lb.
Bassett Scarf Bros.	Armadale	No. 99	Fresian x Jersey	14,538	4.4	629.00
Smith, W. J.	Scotsdale	Madge	Guernsey	9,966	6.1	609.67
McNeil, H. H.	Waroona	No. 44	Shorthorn	12,365	4.6	572.00
Beckett, K. G.	Metricup	Fay	Jersey	9,744	5.6	554.66
Doak, F.	Rosa Brook	Maisie	Jersey x Fresian	12,045	4.4	536.01
Lefroy, T. H. M.	Cowaramup, North	Sara	Guernsey x Shorthorn	9,660	5.5	535.52
Saunders, K. & Son	Northcliffe	Brindle	Jersey x Guernsey	9,135	5.7	525.00
Torrent, J.	Ruabon	Anna	A.I.S.	9,198	5.5	519.60
Foan, O.	Donnybrook	Browny	Jersey	9,174	5.6	516.34
Crooke, G. V.	Cowaramup South	Betty II.	Jersey	11,325	4.5	516.00
Mullins, S.	Pinjarra	Dora	Jersey	11,260	4.5	509.00
Barnsby, G.	Pemberton	Betty	Guernsey	7,495	6.6	499.82
Pugh, F. R. H. & Son	Mt. Barker	Fairy	Red Poll x Jersey	13,500	3.5	477.00
Fry, S.	Harvey	Eliza	A.I.S.	9,594	5.0	474.00
Gilmour, J. (Jr.)	Brunswick	Roana	Guernsey	8,436	5.5	464.91
Haughton, F. V.	Albany	Ettie	Shorthorn x Jersey	9,353	4.8	451.00
Bolt, L. L.	Denmark	Girlie	Jersey	9,063	4.9	448.26
Fennell, C. B.	Margaret River	Isobel	A.I.S.	10,853	4.1	446.00
Brennan, M.	Balingup	Pearl	Jersey x Guernsey	9,890	4.4	444.00
Maidment, S. C.	Nannup	Leo	Jersey x Shorthorn	9,385	4.6	429.00
Morgan, B. I.	Manjimup	Frisky	Jersey	9,348	4.5	425.00
Oldfield, J. H.	Forest Grove	Nell	Guernsey x Jersey	8,228	5.2	422.72
Moyes, H. S. & P.D.	Bridgetown	Reggio	A.I.S.	9,651	4.3	421.00
Reading, R. P.	Vasse-Jindong	Jill	Jersey x Shorthorn	8,335	4.9	415.00
Chapman, K.	Wilga	Jenny	Jersey	7,540	5.4	414.00

The details of the average yield and number of cows in each herd in each unit is given in the following tables.

PINJARRA A.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
D. G. Spark	19	710	366
T. Abbott	20	578	299
R. Beacham	51	628	266
Herd P	28	622	243
„ Z	72	597	243
„ T	19	523	233
„ A*	33	541	229
„ F	38	551	221
„ X	36	503	215
„ B*	37	459	210
„ T*	28	494	207
„ U	43	504	202
„ R*	26	479	190
„ P*	38	416	179
„ K	34	375	168
„ V	22	297	144
„ L*	20	314	142
„ O	57	293	125

WAROONA B.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
T. W. Jackson ...	27	707	319
P. J. Colum ...	28	683	300
H. H. McNeil ...	41	622	278
Herd V	45	694	266
„ I	21	580	265
„ C	34	541	249
„ G	34	502	235
„ R	28	560	233
„ M	82	474	220
„ Q	26	497	217
„ T	35	425	214
„ W..	25	494	208
„ B	27	460	204
„ X..	21	459	193
„ P.	37	410	169
„ Y	30	274	126

HARVEY C.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
C. Carver	22	765	336
L. M. Temple	19	599	294
A. R. Testar	27	557	269
Herd B	40	644	246
„ A	40	469	244
„ U	45	538	237
„ E	45	516	234
„ C	34	532	232
„ X	68	549	231
„ D	48	555	226
„ K	37	535	217
„ M	58	489	190
„ R	32	340	184
„ Z	56	454	180
„ S	26	330	151
„ A*	19	326	150

BRUNSWICK D.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
C. E. Jackson	36	554	291
J. Gilmour (Jr.)	37	589	279
P. J. Edwards	39	537	267
Herd R ...	21	550	247
„ Z	35	498	242
„ O	25	536	223
„ A* . .	15	444	221
„ S	36	472	211
„ T . .	35	409	206
„ B*	33	442	206
„ U . .	62	490	206
„ X . .	34	430	179
„ Y . . .	35	329	157

RUABON E.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
F. Boardman .	10	772	338
H. W. Semmens	55	631	279
J. E. Glendon .	41	645	266
Herd N .	25	641	256
„ M . .	48	596	245
„ D . .	56	590	239
„ Z . .	40	542	228
„ T	33	505	212
„ A ...	30	457	208
„ E* .	32	503	205
„ G . .	50	504	203
„ H ..	38	441	180
„ D* .	31	426	179
„ B	66	432	178
„ Q . .	29	427	175
„ X . .	35	397	161
„ F* ...	38	418	161
„ C* . .	25	368	155
„ DB	41	391	149

METRICUP F.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
K. G. Beckett	29	576	283
J. Hart	23	598	269
A. S. Mutimer ...	25	552	264
Herd F	16	550	238
„ L*	21	526	225
„ R*	22	498	205
„ O	23	479	191
„ K*	59	422	178
„ X	36	386	165
„ P	24	322	156
„ T	30	344	151
„ E*	6	297	137
„ R	16	280	136
„ G*	14	292	128
„ Y	32	237	115
„ Z	16	250	110

* Inverted.

NORTH COWARAMUP G.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
T. H. M. LeFroy	27	677	326
F. Lassen ..	19	659	319
A. L. Gibbs ...	23	610	295
Herd FF ...	12	545	291
„ W . .	22	609	289
„ M ..	22	602	283
„ Z ...	13	583	281
„ BB .	15	541	273
„ G	20	586	267
„ A	26	501	255
„ A* .	24	534	251
„ J	27	528	247
„ DD . .	16	464	235
„ WV ...	24	501	233
„ CC ..	22	448	227
„ C* . .	19	453	221
„ X	39	490	221
„ B*	9	395	182
„ K ...	12	362	155

MARGARET RIVER I.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
C. B. Fennell	22	662	306
N. Stirling ...	20	607	292
A. R. Lang	29	675	286
Herd L	16	616	270
„ T	9	633	267
„ P	15	589	251
„ N	17	520	244
„ XV	31	628	244
„ B*	17	480	235
„ A*	23	506	231
„ D* ...	13	510	226
„ S	22	524	213
„ D	36	508	212
„ O	15	449	201
„ Q* ...	25	491	195
„ P*	24	441	184
„ XR	58	368	168

SOUTH COWARAMUP H.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
G. V. Crooke .	20	780	399
G. Ward ...	14	660	318
A. W. and W. L. Langley	42	728	291
Herd Q	20	620	270
„ HH	17	571	260
„ EE . .	16	552	251
„ DD .	32	608	238
„ KK .	8	610	231
„ F	17	438	227
„ A*	26	498	219
„ C* ...	16	466	217
„ D*	26	446	206
„ E*	20	478	206
„ G	21	456	202
„ L	25	387	197
„ V*	3	376	138
„ S	3	421	181
„ B*	10	282	125
„ I	14	238	97

ROSA BROOK J.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
J. White . .	12	735	319
H. and T. Harrison	30	658	314
A. Maxwell ...	14	681	300
Herd N . .	18	597	297
„ O	12	544	282
„ T	16	548	271
„ X . ..	46	545	261
„ Y	34	479	259
„ K	36	578	258
„ C*	39	502	252
„ L	29	579	250
„ W ..	19	521	248
„ AD ..	15	475	245
„ M . . .	16	529	237
„ F	25	557	235
„ AC ...	18	485	233
„ P* . .	23	483	229
„ AI	14	523	228
„ AE ...	32	414	219
„ AH	19	433	214

* Inverted.

FOREST GROVE K.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
E. G. Noakes	38	634	292
R. J. Hunwick	18	574	272
J. H. Oldfield	39	579	266
Herd R*	13	623	262
" U	19	597	259
" M	18	532	255
" R	25	504	229
" G	20	447	226
" CB	19	484	221
" AE	48	489	220
" Y*	25	512	219
" O	38	473	215
" CF	30	428	214
" G*	21	496	208
" A*	16	466	207
" E*	18	460	203
" C*	15	416	194
" Y	37	496	191
" B*	22	483	188
" Z	21	410	180
" F*	19	394	166

BALINGUP M.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
M. Brennan	28	687	312
J. A. Dowrick	30	663	311
F. Smith	32	549	263
Herd BE	25	553	243
" C	27	521	242
" U	23	508	238
" CH	34	448	223
" CF	28	548	222
" BA	41	546	218
" BJ	24	474	214
" BG	22	450	212
" BM	19	496	207
" BK ...	28	431	206
" BN	16	422	204
" N	50	421	203
" V	60	440	195
" CD	59	458	182
" CE	26	401	175
" CB	14	367	153
" CA ...	32	312	140

DONNYBROOK L.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
O. Foan	21	785	407
Mrs. M. A. Crute	14	596	311
R. Benson	31	570	310
Herd N	6	609	307
" A*	18	644	292
" Y	34	595	290
" Q	22	490	247
" J	31	383	208
" C*	26	438	204
" V	44	506	204
" AB	20	436	190
" B*	18	366	185
" E*	13	353	179
" D*	20	369	165
" X	28	340	160
" AC	19	250	121
" A	27	204	116

MANJIMUP O.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
B. I. Morgan ...	14	622	294
E. Origione ..	11	569	256
J. O. Shepherd ...	14	481	256
Herd G	13	572	252
" Y	9	588	241
" A* ...	28	484	234
" AE .	15	534	226
" J	28	471	213
" T	20	423	204
" AF	15	468	200
" C	36	495	198
" G	23	475	190
" AC	22	420	187
" AD	40	412	184
" V	25	353	174
" U	48	397	170
" AB	24	378	167
" M	35	380	158
" B	34	384	157
" D*	22	326	156
" R	20	341	144
" X	54	317	124
" P	31	385	124

* Inverted.

BRIDGETOWN N.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
H. S. & E. D. Moyes	29	662	257
J. C. Williams	32	451	231
L. R. Beard	18	443	210
Herd IN	28	416	200
„ IS....	13	443	194
„ L*	13	443	194
„ V	38	377	191
„ IV	21	413	182
„ A*	15	414	181
„ S	30	408	180
„ IK	10	415	178
„ IM	36	388	177
„ L	22	399	176
„ B*	30	339	174
„ IX ..	20	394	172
„ Y	22	410	171
„ K*	24	389	162
„ Q . . .	49	413	160
„ Y* ...	13	359	153
„ T	36	365	152
„ IP	17	394	152

WILGA R.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
K. Chapman	31	503	257
J. Thompson	22	574	227
J. S. Charteris	24	489	223
Herd B	24	437	203
„ D	22	456	203
„ M	26	447	189
„ Z	12	477	179
„ J	21	470	178
„ W....	15	386	176
„ L	29	416	174
„ T	20	436	172
„ Y	8	460	169
„ H .. .	19	349	162
„ E	8	322	157
„ R	22	329	147
„ F	29	294	137
„ N	8	305	136
„ I	14	294	132
„ P	22	301	131
„ O	24	284	120
„ U	12	200	81

PEMBERTON P.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
G. H. Barnsby	15	558	395
D. Della	24	805	365
L. Decampo	18	673	261
Herd K	10	589	253
„ G	16	554	249
„ A	23	518	247
„ AD	29	544	239
„ D	21	555	236
„ AB	16	556	214
„ AA	17	466	211
„ Z	5	465	195
„ Y	36	439	195
„ C	23	413	193
„ AC	20	415	181
„ AE	15	476	177
„ M	24	403	176
„ U	26	411	163
„ L	13	353	161
„ J	11	373	157
„ AF	76	331	123

MOUNT BARKER S.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
F. R. H. Pugh	57	628	276
L. F. Frost	25	530	247
Cluett & Sons	35	527	230
Herd Y	18	507	223
„ G	34	518	219
„ T*	30	471	214
„ B	43	467	210
„ H	9	413	209
„ U	29	521	206
„ F	40	471	204
„ W....	20	433	201
„ A*	24	495	196
„ Z	35	405	185
„ P	27	404	178
„ G	26	415	170
„ T	38	442	167
„ A	25	357	164
„ I	22	329	152
„ U*	18	337	151
„ C*	40	297	132
„ X	16	239	10

* Inverted.

ALBANY T.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
J. J. Joyce	15	597	292
Farr Bros.	46	571	287
W. G. McLaren	15	573	270
Herd A	27	515	264
„ L	26	581	259
„ X	12	579	256
„ W	28	611	251
„ U	15	541	237
„ K	26	480	234
„ M	25	481	229
„ Z	17	497	228
„ E*	11	443	226
„ V	15	492	223
„ C	26	523	210
„ P	27	439	201
„ B	31	387	189
„ R	26	430	186
„ H	35	319	152
„ A*	9	262	123
„ O	32	263	111

VASSE-JINDONG V.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
R. P. Reading	42	659	274
H. P. Avery	32	547	242
E. C. Davies	26	589	228
Herd T	40	467	223
„ L	26	495	216
„ I	23	512	214
„ F	23	464	211
„ P	37	442	209
„ B*	22	430	190
„ J	27	491	188
„ Q	42	458	187
„ W....	30	443	187
„ K....	61	361	173
„ H... ...	33	339	158
„ U	20	347	152
„ F*	35	352	143
„ Z	19	270	109
„ V	34	184	83

* Inverted.

NANNUP U.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
V. Knapton	53	584	286
V. Scott .. .	29	791	265
S. C. Maidment	57	651	258
Herd I	25	486	240
„ AD	24	517	235
„ AB	21	439	234
„ BA	19	494	232
„ T	21	444	227
„ BN	21	538	220
„ BG	15	491	220
„ AF	43	528	215
„ B	33	525	213
„ BH	52	413	203
„ V	17	348	197
„ BN	38	393	193
„ BO	15	416	190
„ F	39	476	187
„ U	16	500	184
„ AC	25	410	159
„ BJ	23	321	155
„ BF	15	291	131

DENMARK W.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
W. Middleton	19	746	419
G. Pate	17	675	318
H. Redman	18	572	310
Herd P	26	602	300
„ C	12	524	286
„ E	31	641	286
„ U	17	516	260
„ T	5	568	252
„ I	15	539	248
„ C*	14	573	246
„ F*	19	512	245
„ A*	17	486	240
„ G*	39	466	233
„ B*	20	463	230
„ O	46	541	224
„ V	28	476	223
„ K*	20	395	194
„ Y	19	381	175
„ R	20	348	155

* Inverted.

NORTHCLIFFE X.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
C. and W. Heathcote	25	678	337
Sanders & Son	25	658	328
O. R. Smith ...	13	613	317
Herd R	21	665	301
„ B	33	550	256
„ C	24	508	240
„ A* ...	20	470	239
„ H .	19	576	237
„ E	24	469	232
„ W .	18	444	225
„ U	37	459	220
„ T	21	483	219
„ F* .	16	415	210
„ N	52	441	195
„ M	31	388	195
„ I	26	432	191
„ Q	36	378	180
„ Z	21	386	180
„ K*	28	351	178
„ G	18	357	178
„ J	12	416	175
„ P	42	295	134

SCOTSDALE Y.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
W. J. Smith	14	576	411
J. T. Stephens	18	563	313
J. M. Barry	12	365	304
Herd C	21	614	292
„ O	24	622	259
„ H	17	408	240
„ M	21	481	229
„ J*	23	516	224
„ S	16	342	214
„ R	24	507	211
„ N	44	897	204
„ B	18	348	193
„ Q	23	441	192
„ G*	27	496	184
„ A	7	126	181
„ J	43	751	175
„ V	16	262	164
„ U	13	211	162
„ G	22	355	161
„ V*	20	319	160
„ T	23	332	144
„ A*	12	124	103

ARMADALE-NORTH DANDALUP Z.

Herd.	No. of Cows.	Milk Average. gals.	Butter-fat Average. lb.
A.W Cunningham	50	705	288
Bassett Scarfe Bros.	102	643	287
B. Blomfield	31	617	272
Herd R	16	725	271
„ C	12	489	237
„ L	18	343	215
„ E	28	465	212
„ G	49	474	201
„ N	43	416	197
„ H	56	482	192
„ D	21	354	169
„ T	25	403	155
„ M	58	335	143
„ O	46	361	141
„ P	26	326	124
„ F	18	343	117
„ K	10	236	87

* Inverted.

FERTILISERS.

The following fertilisers have been registered at the Department of Agriculture under the Fertilisers Act, 1928, for the year commencing 1st November, 1949:—

Name of Fertiliser.	No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works (W) or on Rails Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Sol.	Citrate Sol.	Acid Sol.	Total.	Sulphate.	Muriate.	
A.—MINERAL.														
1.—NITROGENOUS.														
(a) Nitrogen as Nitrate.														
Nitrate of Soda	2	David Gray's	David Gray & Co. Pty., Ltd.	15·5										11d. per 2 lb. bag.
Sodium Nitrate	11	Fauldings	F. H. Faulding & Co., Ltd.	16·0										£2 6 8 cwt. (P)
Nitrate of Soda	15	Champion	R. Dundas Smith & Son	16·0										£30 0 0 (W)
Do.	35	Sickle	Cuming Smith & Mt. Lyell F.F., Ltd.	15·5										
Do.	45	Mt. Lyell as ML in diamond	do. do. do.	15·5										
Do.	60	C.S.M.L.	do. do. do.	15·5										
(b) Nitrogen as Ammonia.														
Sulphate of Ammonia	6	David Gray's	David Gray & Co. Pty., Ltd.		21·0									11d. per 2 lb. bag.
Do.	10	Fauldings	F. H. Faulding & Co., Ltd.		20·0									£1 12 8 cwt. (P)
Ammonium Nitrate	13	do.	do. do. do.		30·0									£6 1 4 cwt. (P)
Sulphate of Ammonia	63	I.C.I.A.N.Z.	Cuming Smith & Mt. Lyell F.F., Ltd.		20·5									*£23 0 0 (W)
Do.	72	Cresco	Cresco Fertilisers (W.A.), Ltd.		20·5									*£23 0 0 (W)
2.—PHOSPHATIC.														
(a) Superphosphate.														
Superphosphate	4	David Gray's	David Gray & Co. Pty., Ltd.					18·0	2·0	2·0	22·0			1s. 3½d. per 7 lb. bag.
Do. do. 22%	25	Sickle	Cuming Smith & Mt. Lyell F.F., Ltd.					18·0	2·0	2·0	22·0			*£6 14 0
Do. do.	38	Mt. Lyell as ML in diamond	do. do. do.					18·0	2·0	2·0	22·0			*£6 14 0
Do. do.	47	C.S.M.L.	do. do. do.					18·0	2·0	2·0	22·0			*£6 14 0
Do. do.	74	Cresco	Cresco Fertiliser Co.					18·0	2 0	2·0	22·0			*£6 14 0
(b) Superphosphate and Minors.														
Superphosphate and Manganese	31	Sickle	Cuming Smith & Mt. Lyell F.F., Ltd.					15·0	1·75	1·75	18·5		Manganese. 3·80	*£15 3 9

Do. do. do.	57	C.S.M.L.	do. do. do.			..	..	15 ·0	1 ·75	1 ·75	18 ·5	....	3 ·80	*15 3 9
Do. do. do.	77	Cresco ...	Cresco Fertilisers (W.A.), Ltd.				.	15 ·0	1 ·75	1 ·75	18 ·50	....	3 ·80	15 3 9
												Copper.		
Superphosphate and Copper Ore No. 3	32	Sickle ...	Cuming Smith & Mt. Lyell F.F., Ltd.					16 ·0	1 ·50	1 ·50	19 ·00	1 ·00	...	* 9 1 6 (W)
Do. do. do.	58	C.S.M.L.	do. do. do.					16 ·0	1 ·50	1 ·50	19 ·00	1 ·00	...	* 9 1 6 (W)
Do. do. do.	76	Cresco	Cresco Fertilisers (W.A.), Ltd.					16 ·0	1 ·50	1 ·50	19 ·00	1 ·00	Zinc.	* 9 1 6 (W)
Superphosphate and Zinc No. 2	33	Sickle	Cuming Smith & Mt. Lyell F.F., Ltd.					17 ·25	1 ·75	2 ·00	21 ·00	...	2 ·30	8 16 8 (W)
Superphosphate and Zinc	55	C.S.M.L	do. do. do.					17 00	1 75	1 75	20 ·50	.	2 ·50	* 7 18 1 (W)
Superphosphate and Zinc No. 2	61	do.	do. do do.					17 25	1 ·75	2 ·00	21 ·00		2 ·30	8 16 8 (W)
Do. do. do.	79	Cresco	Cresco Fertilisers (W.A.), Ltd.				Man-ganese.	17 00	2 00	2 00	21 ·00		2 ·40	8 16 8 (W)
Superphosphate and Minor Elements	78	do.	do. do. do.				3 0	13 ·00	1 ·50	1 ·50	16 ·00	1 ·00	3 ·00	15 7 6 (W)
Superphosphate, Copper and Zinc	34	Sickle	Cuming Smith & Mt. Lyell F.F., Ltd.					15 25	1 ·75	1 ·75	18 ·75	1 ·05	2 ·40	
Superphosphate and Copper No. 1	56	C.S.M.L.	do. do. do.					17 ·0	1 ·75	1 ·75	20 ·50	1 ·25	..	*10 12 0 (W)
Superphosphate and Copper Sulphate	75	Cresco	Cresco Fertilisers (W.A.), Ltd.					17 00	1 ·75	1 ·75	20 ·50	1 ·25	..	11 3 2
												Potash (K_2O) as		
3.—POTASSIC.												Sul-phate	Muriate	
(a) Potash as Sulphate.														
Sulphate of Potash . .	8	David Gray's	David Gray & Co. Pty., Ltd.								.	30 ·0	....	11½d .per 2 lb. bag.
Do. do.	36	Sickle	Cuming Smith & Mt. Lyell F.F., Ltd.						...		..	35 ·0	....	*18 8 5 (W)
Do. do. . ..	44	Mt. Lyell as ML in diamond	do. do. do.						.		.	35 ·0	..	*18 8 5 (W)
Do. do. . .	59	C.S.M.L.	do. do. do.							.		35 ·0	. .	*18 8 5 (W)
Do. do. .	73	Cresco	Cresco Fertilisers (W.A.), Ltd.								.	35 ·0	.	*18 8 5 (W)
(b) Potash as Muriate.														
Muriate of Potash	85	Chandler	State (W.A.) Alunite Industry	.								30 ·0	.	
Do. do. . .	37	Sickle	Cuming Smith & Mt. Lyell F F., Ltd.										59 ·0	
Do. do. . .	46	Mt. Lyell as ML in diamond	do. do. do.						.				59 ·0	
Do. do.	62	C.S.M L.	do. do. do.									. .	59 ·0	
Do. do.	71	Cresco	Cresco Fertilisers (W.A.), Ltd.								.	. .	59 ·0	
4.—NITROGEN AND PHOSPHORIC ACID.														
Potato Manure "C"	28	Sickle	Cuming Smith & Mt. Lyell F.F , Ltd.		3 ·50		.	14 ·50	1 ·50	1 ·50	17 ·50	. .	.	*10 17 9 (W)
Do. do. . .	41	Mt. Lyell as ML in diamond	do. do. do.		3 50			14 ·50	1 ·50	1 ·50	17 ·50	...	....	*10 17 9 (W)

FERTILISERS—*continued.*

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as Nitrate.	Nitrogen (N) as Ammonia.	Nitrogen (N) as Blood and Bone.	Nitrogen (N) as Bone Dust.	Phosphoric Acid (P_2O_5) as Water Sol.	Phosphoric Acid (P_2O_5) as Citrate Sol.	Phosphoric Acid (P_2O_5) as Acid Sol.	Phosphoric Acid (P_2O_5) as Total.	Potash (K_2O) as Sulphate.	Potash (K_2O) as Muriate.	Cash Price per ton at Works (W) or on Rails Perth. (P)
4.—Nitrogen and Phosphoric Acid—*continued.*														£ s. d.
Potato Manure "C" *continued*	50	C.S.M.L.	Cuming Smith & Mt. Lyell F.F., Ltd.	...	3·50	..	.	14·50	1·50	1·50	17·50	....	...	*10 17 9 (W)
Lawn Manure	21	Dawn	Dawn Nurseries	..	8·54	.	..	9·23	1·36	0·82	11·4	...	.	
Potato Manure "C"	82	Cresco	Cresco Fertiliser Co.	.	3·50	.	.	14·50	1·50	1·50	17·50	...	...	*10 17 9 (W)
5.—Nitrogen Phosphoric Acid and Potash.														
Potato Manure "A"	26	Sickle	Cuming Smith & Mt. Lyell F.F., Ltd.	..	2·50	.	.	12·00	1·25	1·25	14·50	5·00	.	*11 19 10 (W)
Potato Manure "B"	27	do.	do. do. do.	...	3·50	.	.	11·0	1·25	1·25	13·50	5·00	...	*12 17 6 (W)
Potato Manure "E"	29	do.	do. do. do.	..	3·50	.	..	8·50	1·0	1·0	10·50	8·00	....	*14 1 4 (W)
Potato Manure "A"	39	Mt. Lyell as ML in diamond	do. do. do.	....	2·50	....	...	12·00	1·25	1·25	14·50	5·0	....	*11 19 10 (W)
Potato Manure "B"	40	do.	do. do. do.	....	3·50	...	..	11·0	1·25	1·25	13·50	5·00	....	*12 17 6 (W)
Potato Manure "E"	42	do.	do. do. do.	....	3·50	...		8·50	1·0	1·0	10·50	8·00	....	*14 1 4 (W)
Potato Manure "A"	48	C.S.M.L.	do. do. do.	....	2·50	..	.	12·0	1·25	1·25	14·50	5·00	....	*11 19 10 (W)
Potato Manure "B"	49	do.	do. do. do.	...	3·50	...	..	11·0	1·25	1·25	13·50	5·0	...	*12 17 6 (W)
Potato Manure "E"	51	do.	do. do. do.	....	3·50	...	..	8·50	1·0	1·0	10·5	8·00	...	*14 1 4 (W)
Potato Manure "A"	80	Cresco	Cresco Fertiliser Co.	...	2·50	..	..	12·00	1·25	1·25	14·50	5·00	..	*11 19 10 (W)
Potato Manure "B"	81	do.	do. do. do.	.	3·50	..	.	11·0	1·25	1·25	13·50	5·00	..	*12 17 6 (W)
Potato Manure "E"	83	do.	do. do. do.	.	3·50	..	.	8·50	1·0	1·0	10·5	8·00	...	*14 1 4 (W)
Potato Manure "A"	3	David Gray's	David Gray & Co. Pty., Ltd.	..	2·50	..		12·00	1·25	1·25	14·50	5·00	....	1s. 8d. per 7 lb. bag.
Orchard Manure	30	Sickle	Cuming Smith & Mt. Lyell F.F., Ltd.	..	3·50	.	..	11·0	1·25	1·25	13·50	5·00	....	*12 17 6 (W)
Do. do.	43	Mt. Lyell as ML in diamond	do. do. do.	.	3·50	..	..	11·0	1·25	1·25	13·50	5·00	...	*12 17 6 (W)
Do. do.	52	C.S.M.L.	do. do. do.	..	3·50	.	.	11·0	1·25	1·25	13·50	5·00	....	*12 17 6 (W)
Do. do.	84	Cresco	Cresco Fertiliser Co.	.	3·50	.	.	11·0	1·25	1·25	13·50	5·00	..	*12 17 6 (W)
Tomato Manure	53	C.S.M.L.	Cuming Smith & Mt. Lyell F.F., Ltd.	..	3·50	...	.	6·00	0·75	0·75	7·50	12·00	...	*15 13 3 (W)
Tobacco Fertiliser	54	do.	do. do. do.	...	3·30	..	..	10·0	1·25	1·25	12·50	5·70	..	*13 15 3 (W)
Rose Manure	22	Dawn	Dawn Nurseries	...	5·90		..	10·3	1·52	0·91	12·7	1·64	...	
Bulb and Corn Manure	23	do.	do.	.	1·9	..	..	9·2	1·4	0·8	11·4	9·0	....	
Seedling Manure	24	do.	do.	..	5·3	.	.	8·75	1·25	1·0	11·0	4·4	....	
6.—Miscellaneous.														
Liquid Manure	1	David Gray's	David Gray & Co. Pty., Ltd.	...	9·0	..	...	6·0	....	....	6·0	4·0	....	3s. per 20 oz. bottle.
Rose Manure	5	do.	do. do. do.	....	5·6	....	...	3·89	....	1·94	5·93	3·2	....	3s. 3d. per 7 lb. bag.
Powdered Fertiliser	7	do.	do. do. do.	....	5·6	....	....	3·89	....	1·94	5·93	3·2	....	3s. per 7 lb. bag.

Liquid Manure	12	Fauldings	F. H. Faulding & Co.	....	7·50	....	....	5·0	....	....	5·0	3·50	....	
Liquid Fertiliser	16	10–10–5	Wigmores, Ltd.	....	10·0	....	....	10·0	....	....	10·0	5·0	....	15s. per gallon.
Fertiliser Tablets	66	Summit	L. M. McLeod	....	4·1	....	....	7·0	1·2	0·1	8·3	12·2	....	1s. per box retail.
Plant Food	20	Dawn	Dawn Nurseries	....	5·23	..	....	11·21	1·41	1·46	14·08	....	....	
Hypon No. 2	67	Hypon	Hydroponics Pty., Ltd.	..	4·0	...	..	5·0	....	....	5·0	4·0	....	3s. per 20 oz. bottle.
Hypon No. 4	68	do.	do. do. do.	.	3·00	....	..	6·0	....	..	6·0	7·0	....	3s. per 20 oz. bottle.
Hypon No. 6	69	do.	do. do. do.	.	5·00	...		4·00	.	.	4·00	3·0	...	3s. per 20 oz. bottle.
B.—ORGANIC.														
(a) *Blood and Bone.*														
Animal Fertiliser	9	A and A Surprise	C. A. Kirkby & Sons		.	5·50	..		4·0	10·0	14·0	..	....	18 10 0 (P)
Blood and Bone	14	Wyndham	Wyndham Freezing and Meat Works		..	6·0		.	6·5	9·0	15·5	...	.	16 3 6 (P)
Animal Fertiliser	17	Blue Cross	Agricultural Products Co.	.	..	3·0		.		...	15·0	.		
Animal Fertiliser	64	State Abattoirs, Midland Junction	State Abattoirs		..	8·0	...	.	.	.	5·0	.	....	13 0 0 (W)
Animal Fertiliser	65	State Abattoirs, Kalgoorlie	do.	...	.	8·0	.	....	...	...	5·0	....	....	16 0 0 (W)
Blood and Bone	70	Kitchens	J. Kitchen & Sons Pty., Ltd.	..		7·0	.	.	9·0	5·0	14·0	...	..	
Do.	87	TB & S in diamond	Thos Borthwick & Sons		.	5·75		..	6·75	5·25	12·0	.	...	14 0 0 (W)
Animal Fertiliser	88	Wooltana	Wooltana Industries, Ltd.		.	4·0	..	..	...	10·0	10·0	...	..	
Bonex Fertiliser	89	do.	do. do. do.			2·5		.	.	10·0	10·0	...	..	
B.B. Fertiliser	90	do.	do. do. do.		.	4·0	.	.	..	10·0	10·0	.	..	
(b) *Bone Dust.*														
(c) *Fish Fertiliser.*														
Fish Fertiliser	18	Cormo	Nor-West Fertiliser			5·0	..			.	8·0	..	.	
(d) *Miscellaneous.*														
Garden Fertiliser	19	Sprout-em	Kag Manufacturing Co.			.	2·75		5·0	4·0	9·0	..	.	
Fertiliser	86	APEX (C & R)	W.A. Produce Co.		5·0		..	.	..		9·0			16 0 0 (P)
Superhumus No. 1	91	Superhumus	W. E Sheffield		2·0		.	1·8	0·5	0·2	2·5	2·0	.	13s. 3d. per doz. (4 lb.) wholesale.
Superhumus, No. 2	92	do.	do.		4·0	.		3·0	0·5	6·5	10 0	0·5	....	13s. 3d. per doz. (4 lb.) wholesale.
Fertiliser	93	Growmore F/12	C. J. Turle	.	2·2	..	.	0·223	1·8	....	11·4	2·75	...	3s. 2d. per 7 lb. bag.

(W) At Works. (P) At Perth. * Net Cash at Works after deducting Commonwealth Superphosphate Subsidy. † F.O.B. Melbourne.

PULLORUM TESTED FLOCKS

The following is a list of flocks which have been regularly tested under the Voluntary Pullorum Disease Control Scheme conducted by this Department and which have complied with the requirements set out therein.

The breeds included in these tests are indicated as follows; A. O. Australorps, W.L. White Leghorns, R.I.R. Rhode Island Reds.

Name.	Address.	Number of Birds.	Breed.	Percentage Reaction at last Test.
Anthony, P.	Kenwick	796	W.L.	0.2
Carter, S. F.	Osborne Park	2135	W.L., AO	3.3
Collingwood, W. P. & C. A.	Collie Burn	2100	A.O.	0.0
Dempster, F.	Wanneroo	667	W.L., A.O.	0.7
Duncan, J.	Belmont	1893	W.L. and A.O.	3.5
Fischer, P.	Darlington	1023	A.O.	3.8
Hampton, A.	Belmont	1062	A.O., R.I.R., W.L.	1.3
Kendall, L. J.	Guildford	225	A.O. and W.L.	2.2
Lea, E. F.	Tuart Hill	913	A.O. and W.L.	2.7
Leonard, E. M.	Mt. Helena	2090	A.O. and W.L.	3.6
Martin, V.	Gosnells	1904	W.L., A.O., R.I.R.	1.5
Purves, N.	Armadale	1826	R.I.R., W.L., A.O.	3.4
Sexton, F. P.	Wanneroo	1572	A.O.	0.9
Skelton, T. R.	Swan View	643	A.O., R.I.R., W.L.	1.1
Smith, J.	Darlington	1208	A.O. and W.L.	3.1
Smith, J. E.	Tuart Hill	2035	A.O., R.I.R., W.L.	2.6
Stocker, M.	Roleystone	839	W.L.	1.0
Vickers, F. B.	Bayswater	930	W.L.	0.6
White, W.	Kelmscott	1162	W.L.	2.9
Whitfield, F. T.	Kellerberrin	1588	A.O. and W.L.	0.0

MURESK EGG LAYING TRIAL No. 19

GENERAL REVIEW.

K. M. COWIN, M.D.A.

Poultry Instructor—Muresk Agricultural College.

The nineteenth test of the Muresk Egg Laying Trials terminated on March 2, 1949—a period of 336 days.

This trial compared very favourably with previous trials in regard to eggs produced. False moulting was prevalent in the White Leghorns during the early part of the trial, probably due to change of environment and confinement in small pens. The Heavy and Medium-Heavy Breeds were not affected to any great degree.

Health of birds was good throughout the trial.

Weather conditions.—A comparatively dry winter period was followed by hot dry summer conditions which did not contribute towards high egg production.

The following table shows rainfall recorded, number of days with minimum temperature of 35°F and under, and maximum temperature of 95° and over at Muresk during the period of the trial—

Month.	Points.	No. of Wet Days.	No. of Days min. 35° and under.	No. of Days max. 95° and over.	Hottest Day of Month.
1948—					Degrees.
April	107	8	....	.	89.6
May	3	2	2	..	92.0
June	358	14	13		74.4
July	407	17	4	..	69.5
August . ..	322	17	2		80.2
September . ..	244	13	2		82.0
October	45	6	2	1	95.4
November .	147	4		2	100.0
December	66	2	..	3	102.8
1949—					
January .	3	1	.	10	107.8
February . .	80	3	.	5	104.2
March (2 days) .	.	.	..	...	85.4
	1,782	87	25	21	...

SUMMARY OF RESULTS FOR LAST THREE TRIALS.

Analyses of Breed results are shown hereunder.

WHITE LEGHORN.

Year.	Number of Birds.	Per centage Total Entries.	Number of Deaths.	Per centage deaths in Section.	Number birds completed Test.	Production 1st Grade Eggs. Number.	Production 1st Grade Eggs. Average per bird.	Production 2nd Grade Eggs. Number.	Production 2nd Grade Eggs. Average per bird.	Total Egg Production. Number.	Total Egg Production. Average per bird.
1946–47	216	51·43	11	5·09	205	34,222	158·42	3,241	15·00	37,463	173·42
1947–48	180	51·72	11	6·11	169	27,265	151·47	2,691	14·95	29,956	166·38
1948–49	144	39·34	10	6·94	134	22,749	157·97	3,023	20·99	25,772	178·97
AUSTRALORP.											
1946–47	162	38·57	9	5·55	153	28,548	176·22	3,105	19·16	31,653	195·38
1947–48	144	41·38	10	6·94	134	27,522	191·12	1,380	9·58	28,902	200·71
1948–49	174	47·54	15	8·62	159	30,348	174·41	4,043	23·23	34,391	197·64
CHINESE LANGSHAN.											
1946–47	12	2·86	...	..	12	2,007	167·25	201	16·75	2,208	184·00
1947–48	12	3·45	..		12	2,010	177·50	250	20·83	2,260	188·33
1948–49	30	8·19	1	3·33	29	4,555	151·83	646	21·53	5,201	173·36
RHODE ISLAND RED.											
1946–47	30	7·14	2	6·66	28	3,584	119·46	605	20·16	4,189	139·63
1947–48	12	3·45	..		12	1,533	127·75	581	48·42	2,114	176·16
1948–49	18	4·91	1	5·55	17	2,515	139·72	563	31·83	3,078	171·55

Grading of Eggs.

All eggs were weighed in accordance with Regulation 2 which states—

First Grade.—During the first two months of the trial a first grade egg shall weigh not less than 1¾ ozs., thereafter during the remainder of the trial a first grade egg shall weigh not less than 2 ozs.

Second Grade—The minimum weight of a second grade egg shall weigh not more than ¼ oz. less than a first grade. Second grade eggs will be recorded but not counted. The following table shows average production for the last three years.

Breed.	1946-47.	1947-48.	1948-49.
White Leghorn	173.42	166.38	178.97
Australorp	195.38	200.71	197.64
Chinese Langshan	184.00	188.33	173.36
Rhode Island Red	139.63	176.16	171.55
All Breeds	173.10	181.70	180.38

GROUPS OF EGG PRODUCTION IN LAST THREE TRIALS—ALL EGGS COUNTED.

Year.	Producing 100 eggs and under.		101-150.		151-200.		201-250.		251 and over.	
	No. of Birds.	%	No. of Birds.	%	No. of Birds.	%	No. of Birds.	%	No. of Birds.	%
1946-47	25	5.95	51	12.14	186	44.28	142	33.80	16	3.80
1947-48	27	7.76	35	10.05	144	41.38	120	34.48	22	6.32
1948-49	24	6.55	42	11.47	137	37.43	136	37.15	27	7.37

The following tables show the various groups of egg production for each Breed for the last three Trials—All eggs counted.

1946-47.

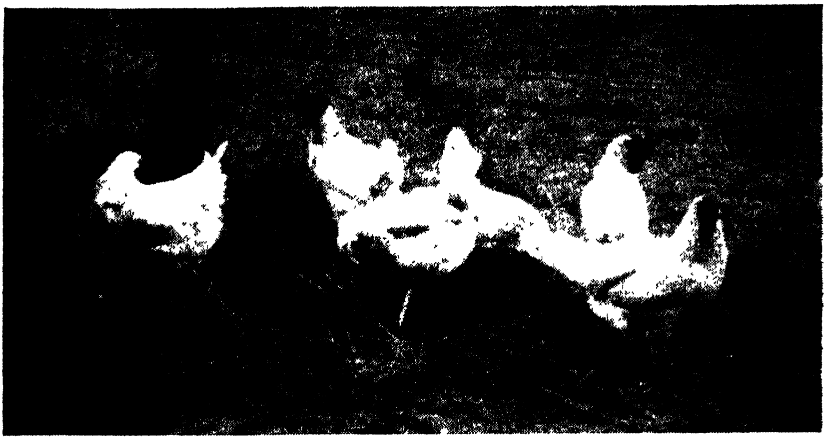
Breed.	No. of Birds.	100 and under.		101-150.		151-200.		201-250.		251 and over.	
		No. of Birds.	%	No. of Birds.	%	No. of Birds.	%	No. of Birds.	%	No. of Birds.	%
White Leghorn	216	11	5.09	24	11.11	122	56.48	58	26.85	1	.46
Australorp	162	10	6.17	13	8.02	46	28.39	78	48.14	15	9.25
Chinese Langshan	12			1	8.33	8	66.66	3	25.00	...	.
Rhode Island Red	30	4	13.33	13	43.33	10	33.33	3	10.00		..

1947-48.

Breed.	No. of Birds.	100 and under.		101-150.		151-200.		201-250.		251 and over.	
White Leghorn	180	20	11.11	24	13.33	88	48.88	43	23.88	5	2.77
Australorp	144	6	4.16	8	5.55	49	34.02	64	44.44	17	11.80
Chinese Langshan	12	...		1	8.33	5	41.66	6	50.00	..	....
Rhode Island Red	12	1	8.33	2	16.66	2	16.66	7	58.33	...	....

1948-49.

Breed.	No. of Birds.	100 and under.		101-150.		151-200.		201-250.		251 and over.	
		No. of Birds.	%	No. of Birds.	%	No. of Birds.	%	No. of Birds.	%	No. of Birds.	%
White Leghorn	144	11	7.63	18	12.50	63	43.07	51	35.41	1	.69
Australorp	174	10	5.74	15	8.62	52	29.88	74	42.52	23	13.21
Chinese Langshan	30	2	6.66	6	20.00	13	43.33	7	23.33	2	6.66
Rhode Island Red	18	1	5.55	3	16.66	9	50.00	4	22.22	1	5.55



J. E. Smith's team White Leghorns, 139-144; 1,137 1st Grade Eggs, 36 2nd Grade. Winners Section A, 1948-49. Winners Summer Test, Section A, 1948-49. Winners Type Judging Section A, 1948-49.

Mrs. F. T. Whitfield's Team Australorps, 67-72; 1,354 1st Grade eggs, 12 2nd Grade. Winners Section B, 1948-49. Winners Summer Test, Section B, 1948-49.

WINTER TEST.

The first four months of the trial—1st April to 31st July is known as the Winter test.

The following particulars show the winners for the last three trials, and number of eggs laid.

Section " A."—White Leghorn.

	1946-47.	No.	1947-48.	No.	1948-49.	No.
1st	Mrs. McFadden ...	382	Max Stocker .	381	W. R. Webb	350
2nd	G. A. Johnson . .	375	L. C. Cant	369	W. R. Webb	334
3rd	C. F. Schwarz ...	357	E. E. Price	340	M. Love ..	333

Section "B."—Australorps.

1st	V. J. Dadley	534	Miss J. M. Dadley ...	505	J. E. Smith ...	532
2nd	C. Mitchell	490	V. J. Dadley	484	J. E. Smith	498
3rd	Miss J. M. Dadley	471	F. T. Whitfield	484	Mrs. M. H. Dadley ...	482

Section 'C."—Rhode Island Reds and Chinese Lanzshan.

	1946-47.	No.	1947-48.	No.	1948-49.	No.
1st	A. Machlin	311	T. Parker (C.L.)	478	T. Parker (C.L.)	388
2nd	W. L. Hoops	268	Mrs. F. G. Revill (R.I.R.)	287	A. Hampton (C.L.)	293

M. Love's White Leghorn, No. 9. Highest individual score in Section A, 235 1st Grade eggs with a total weight of eggs laid 500.1 ozs.

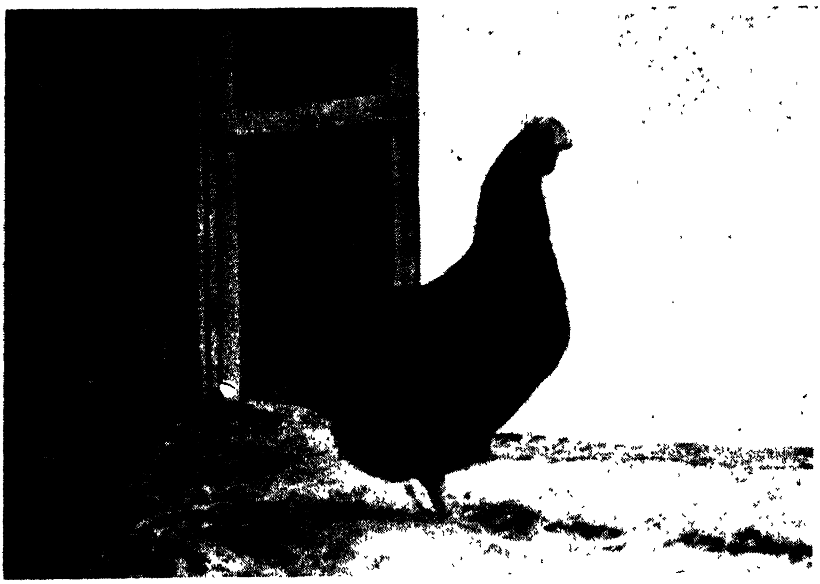
R. C. Comb's White Leghorn, No. 42. Second highest individual score in Section A, 235 1st Grade eggs with a total weight of eggs laid 485.2 ozs.

SUMMER TEST.

The period 1st December to the termination of the trial is known as the Summer Test.

The following particulars show the winners and number of eggs laid.

Section.	1946–47.	No.	1947–48.	No.	1948–49.	No.
A	E. E. Price	347	E. E. Price	341	J. E. Smith ..	361
B	C. Mitchell	311	M. H. Dadley .	357	Mrs. T. F. Whitfield	334
C	G. E. Price (R.I.R.)	256	T. Parker (C.L.) .	228	J. E. Smith (R.I.R.) .	2 7



A. Hampton's Australorp, No. 84. Highest individual in Section B, 271 1st Grade eggs.

Government Standard Certificate.

Standard certificates and sealed copper bands are awarded to birds that lay 200 1st grade eggs or over during the period covered by the trial.

Table below shows number and percentage of certificate winners for the last three trials—

Trial.	No. of Birds in Trial.	No. of Birds Qualified.	Percentage.
1946–47	420	108	25.71
1947–48 . . .	348	111	31 60
1948–49 . . .	366	102	27.86

The following is a list of complete scores for all entries in 1948/49 trial. Birds which qualified for Standard Certificates are marked with an asterisk.

Mrs. A. H. Dadley's Australorp, No. 150. Second highest individual in Section B, 268 1st Grade Eggs.

J. E. Smith's Rhode Island Red, No. 47. Highest individual in Section C, 261 1st Grade eggs.

Section "A" Light Breed—White Leghorn.

Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd	Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd
M. Love, North Lake Rd., Melville	1	184	2			C. Rodgers, Yarraville P.F., Armadale	73	148	5		
	2	†111	24				74	152	...		
	3	112	30				75	126	99		
	4	196	2				76	183	17		
	5	170	11				77	†88	...		
	6	*212	1	985	70		78	17	2	714	123
M. Love, North Lake Rd., Melville	7	*228	3			C. Rodgers, Yarraville P.F., Armadale	79	196	36		
	8	*224	....				80	*218	7		
	9	*235	1				81	197	1		
	10	107	....				82	148	96		
	11	173	6				83	156	10		
	12	88	15	1,055	25		84	†81	..	996	150
T. H. Gray, Norma Rd., Melville	13	*213	1			I. Schwarz, Harold St., Gosnells	85	164	15		
	14	173	66				86	149	22		
	15	174	18				87	161	30		
	16	*213	2				88	191	28		
	17	96	164				89	*212	9		
	18	*233	7	1,102	258		90	*202	1	1,079	105
G. A. Johnson, Spencer Rd., Cannington	19	*210	2			W. R. Webb, Wanneroo Rd., Tuart Hill	91	147	1		
	20	*200	6				92	. 164	20		
	21	*202	.				93	142	84		
	22	130	67				94	195	9		
	23	143	4				95	171	14		
	24	75	33	960	112		96	155	11	974	139
J. Duncan, East Belmont Post Office	31	161	17			W. R. webb, Wanneroo Rd., Tuart Hill	97	*210	6		
	32	140	68				98	*203	10		
	33	190	7				99	74	82		
	34	159	18				100	148	11		
	35	185	5				101	199	20		
	36	80	23	915	138		102	168	55	1,002	184
R. C. Combs, North Lake Rd., Melville	37	128	1			W. S. Johns, Naval Oil Fuel Installation, Fremantle	109	179	1		
	38	156	27				110	172	6		
	39	*222	1				111	149	3		
	40	194	...				112	*200			
	41	150	.				113	141	64		
	42	*235	11	1,085	40		114	119	6	960	80
A. Hampton, Scott St., Belmont	43	173	36			W. S. Johns, Naval Oil Fuel Installation, Fremantle	115	183	34		
	44	163	.				116	192			
	45	196	10				117	104	71		
	46	66	139				118	199	3		
	47	†24	34				119	185	1		
	48	†19	44	641	263		120	146		1,009	109
E. E. Price, 279 South St., Fremantle	49	162	32			Max Stocker, "Cavvystock," Roleystone	121	159	30		
	50	*217	10				122	169	39		
	51	*231	6				123	164	5		
	52	178	15				124	198	13		
	53	39	99				125	159	44		
	54	187	3	1,014	165		126	*215	1	1,064	132
E. E. Price, 279 South St., Fremantle	55	176				Max Stocker, "Cavvystock," Roleystone	127	100	121		
	56	169	15				128	71	42		
	57	152	51				129	127	59		
	58	†73	1				130	76	.		
	59	164	6				131	176	17		
	60	115	24	849	97		132	†77	26	627	265
E. E. Price, 279 South St., Fremantle	61	†78	8			H. D. Mutton, River Road, Kelmscott	133	*202	8		
	62	159	4				134	182			
	63	162	5				135	*218			
	64	78	2				136	99	2		
	65	121	77				137	*234	7		
	66	191	5	789	101		138	†149	15	1,084	32
Mrs. E. E. Price, 279 South St., Fremantle	67	†6	36			J. E. Smith, Swan St., Tuart Hill	139	*207	.		
	68	153	11				140	189	....		
	69	168	.				141	185	1		
	70	169	1				142	150	1		
	71	143	9				143	*203	23		
	72	58	62	697	119		144	*203	11	1,137	36

† Bird died.

Section "A"—*continued.*

Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd	Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd
J. E. Smith, Swan St., Tuart Hill	145	187	24			G. Dolman, Ilma St., Gosnells	151	190	2		
	146	184	..				152	119	94		
	147	190					153	157	40		
	148	191	11				154	146	55		
	149	58	30				155	197	....		
	150	197	22	1,007	87		156	195	2	1,004	193

Section "B" Heavy Breeds—Australorps.

Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd	Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd
S. Potter, Box 123, Katanning	1	194	....			F. T. Whitfield, Massingham St., Kellerberrin	61	183	1		
	2	*241	....				62	*223	11		
	3	145	1				63	175	1		
	4	*207	1				64	180	.		
	5	*200	1				65	162	33		
	6	196		1,183	3		66	196	...	1,119	46
Mrs. S. Potter, Box 123, Katanning	7	197	9			Mrs. F. T. Whitfield, Massingham St., Kellerberrin	67	188	..		
	8	*215	2				68	*258			
	9	174	1				69	194	11		
	10	169					70	*222	1		
	11	187	1				71	*233			
	12	192	8	1,134	21		72	*259		1,354	12
T. Gent, Hector St., Osborne Park	13	138	69			A. Hampton, Scott St., Belmont	73	169	1		
	14	176					74	139	51		
	15	*215					75	143	13		
	16	148					76	6	115		
	17	117	3				77	177	1		
	18	162	37	956	109		78	*231	1	865	182
T. H. Gray, Norma Rd., Melville	19	103	103			A. Hampton, Scott St., Belmont	79	185	40		
	20	179	72				80	*221	2		
	21	154	1				81	197	8		
	22	*218	14				82	137	1		
	23	160	4				83	*203	1		
	24	*219		1,033	194		84	*271	1	1,214	53
T. F. Hugall, Kalamunda Rd., Maida Vale	25	171	4			W. G. Hall, Post Office, Jandakot	85	172	4		
	26	*211	28				86	198	5		
	27	184	62				87	181			
	28	196	7				88	163	6		
	29	162	24				89	*207	5		
	30	166	103	1,090	228		90	197		1,118	20
T. F. Hugall, Kalamunda Rd., Maida Vale	31	184				W. G. Hall, Post Office, Jandakot	91	161	29		
	32	159					92	174			
	33	*213	45				93	*248	2		
	34	*242	13				94	114	94		
	35	*238	1				95	*243	3		
	36	6	92	1,042	151		96	*208	4	1,148	132
R. C. Combs, North Lake Rd., Melville	37	155	110			W. G. Hall, Post Office, Jandakot	97	26	172		
	38	110	50				98	58	197		
	39	166	43				99	†134	3		
	40	†59	8				100	*238	4		
	41	107	5				101	*247	1		
	42	155	2	752	218		102	*233	.	936	377
R. C. Combs, North Lake Rd., Melville	43	186	..			E. E. Price, 279 South St., Fremantle	103	†17	1		
	44	*222	3				104	†33	20		
	45	3	193				105	†37	2		
	46	*230	6				106	164	1		
	47	171	85				107	126	8		
	48	*245	9	1,057	296		108	†54	...	431	32
A. R. Caporn, Edeline Rd., Spearwood	49	125	57			E. E. Price, 279 South St., Fremantle	109	198	53		
	50	146	8				110	†43	10		
	51	52	151				111	†108	4		
	52	*234	3				112	160	..		
	53	30	146				113	†77	4		
	54	†130	55	717	420		114	†41	7	637	78
Mrs. R. McDougall, "Boyning," Wickepin	55	193	28			Mrs. E. E. Price, 279 South St., Fremantle	115	†130	14		
	56	*201	9				116	*216	23		
	57	35	122				117	179	15		
	58	*208	46				118	59	40		
	59	193	44				119	*210	3		
	60	50	197	880	446		120	†147	34	941	129

† Bird died.

Section "B"—*continued.*

Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd
T. Schwarz, Harold St., Gosnells	121	*201	1		
	122	183	69		
	123	132	1		
	124	*251			
	125	170	100		
	126	*246	1	1,183	172
M. H. Dadley, Rockingham Rd., South Coogee	127	181	2		
	128	94	1		
	129	*248			
	130	*241	3		
	131	187	32		
	132	*205	2	1,156	40
M. H. Dadley, Rockingham Rd., South Coogee	133	*225	..		
	134	*251	2		
	135	*239	17		
	136	144			
	137	167	2		
	138	*226	21	1,252	42
Mrs. M. H. Dadley, Rockingham Rd., South Coogee	139	*224	55		
	140	*221			
	141	153			
	142	*248			
	143	*240			
	144	*228		1,314	55
Mrs. M. H. Dadley, Rockingham Rd., South Coogee	145	187	49		
	146	*240			
	147	*206	1		
	148	*212			
	149	*227	3		
	150	*268	.	1,340	53

Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd
V. J. Dadley, Rockingham Rd., South Coogee	151	†118	2		
	152	44	113		
	153	*262			
	154	*207			
	155	*217			
	156	189	3	1,037	118
J. E. Smith, Swan St., Tuart Hill	157	*216			
	158	179	3		
	159	172	1		
	160	†118			
	161	*225	6		
	162	*237	1	1,147	11
J. E. Smith, Swan St., Tuart Hill	163	178			
	164	158	3		
	165	138	.		
	166	*229			
	167	*247			
	168	*239	1	1,189	4
J. B. Inkpen, 148 Waratah Avenue, Claremont	169	181	82		
	170	†102	142		
	171	*245	1		
	172	*263	1		
	173	95	174		
	174	*237	1	1,123	401

† Bird died.

Section "C" Medium Heavy Breeds—Chinese Langshans.

Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd
Thos. Parker, Hartfield Rd., Forrestfield	1	89	88		
	2	142			
	3	98	50		
	4	177	2		
	5	*207	3		
	6	140	26	853	169
Thos. Parker, Hartfield Rd., Forrestfield	7	*236	24		
	8	*229	6		
	9	189	9		
	10	165	1		
	11	117	6		
	12	141	70	1,077	116
Thos. Parker, Hartfield Rd., Forrestfield	13	*202	22		
	14	170	11		
	15	180	52		
	16	145	30		
	17	153	.		
	18	109	48	959	163
A. Hampton, Scott St., Belmont	19	101	16		
	20	145	1		
	21	134	24		
	22	*205			
	23	*241	25		
	24	126	.	952	66

Competitor.	Bird No.	Score. 1st	Score. 2nd	Team Total. 1st	Team Total. 2nd
A. Hampton, Scott St., Belmont	25	†			
	26	72	15		
	27	128	53		
	28	186	63		
	29	182	1		
	30	146		714	132
A. Hampton, Scott St., Belmont	31	184			
	32	112	104		
	33	73			
	34	112	74		
	35	156	1		
	36	176	34	813	213
J. E. Smith, Swan St., Tuart Hill	37	65	107		
	38	164	8		
	39	148	12		
	40	163	41		
	41	86	67		
	42	†80	24	706	259
J. E. Smith, Swan St., Tuart Hill	43	72	41		
	44	137	19		
	45	123	6		
	46	170	8		
	47	*261	8		
	48	*233	9	996	91

† Bird died.

At a social arranged by the Committee of Management in the Sheel Oil Co.'s Theatrette and Social Rooms, St. George's Terrace, Perth, on 19th May, 1949, the Hon. Minister of Agriculture, Mr. G. B. Wood presented the trophies to the successful competitors in the 1948/49 Trial.

Trophy list showing donors and successful competitors.

MURESK AGRICULTURAL COLLEGE.

Egg Laying Trials—1948-1949.

	Score. 1st Grade.	Score. 2nd Grade.
Champion Certificate:		
David Gray's Trophy. Won by Mrs. F. T. Whitfield—Australorps	1354	12
Teams of Six Birds:—Section "A" Light Breeds. White Leghorns.		
1st Prize—Westfarmers Cup and Trophy. Won by J. E. Smith	1137	36
2nd Prize—R. E. Young's Trophy. Won by T. H. Gray	1102	258
3rd Prize—C. Rodger's Trophy. Won by R. C. Combs	1085	40
Teams of Six Birds:—Section "B" Heavy Breeds. Australorps.		
1st Prize—Scanlon's Trophy and Thomas & Co. Trophy. Won by Mrs. F. T. Whitfield	1354	12
2nd Prize—W.A. Egg Marketing Board Trophy. Won by Mrs. M. H. Dadley ..	1340	53
3rd Prize—Kirkby & Sons' Trophy. Won by Mrs. M. H. Dadley	1314	55
Teams of Six Birds:—Section "C" Medium-Heavy Breeds. Rhode Island Reds and Langshans.		
1st Prize—Dunklings' Cup and Trophy. Won by T. Parker (Langshans)	1077	116
2nd Prize—Barrow Linton's Trophy. Won by J. E. Smith (R.I.R.)	996	91
3rd Prize—York Flour Mill Trophy. Won by T. Parker (Langshans)	959	163
Winter Test:—From April 1st to July 31st		
Section "A" Light Breeds.		
1st Prize—Haynes & Clements' Trophy. Won by W. R. Webb	350	64
Section "B" Heavy Breeds.		
1st Prize—J. Loris Trophy. Won by J. E. Smith	532	4
Section "C" Medium Heavy Breeds.		
1st Prize—R. Piercey's Trophy. Won by T. Parker (Langshans)	388	40

	Score. 1st Grade.	Score. 2nd Grade.
***Summer Test*:—From December 1st, 1948 to March 2nd, 1949.**		
Section "A" Light Breeds.		
1st Prize—Western Ice Cup and Trophy. Won by J. E. Smith (No. 2 team)	366	21
Section "B" Heavy Breeds.		
1st Prize—Western Ice Cup and J. E. Smith's Trophy. Won by F. T. Whitfield	360	10
Section "C" Medium Heavy Breeds.		
1st Prize—Western Ice Cup and M. H. Dadley's Trophy. Won by J. E. Smith (R.I.R.)	247	26
***Individual Birds*:—Section "A" Light Breeds.**		
1st Prize—Giles & Ryan's Trophy. Won by M. Love—No. 9 (Total wt. of eggs laid 500.1 oz.	235	1
2nd Prize—Baird's Trophy. Won by R. C. Combs —No. 42 (Total wt. of eggs laid 485.2 oz.)	235	11
Section "B" Heavy Breeds.		
1st Prize—Baird's Cup and Cullin's Trophy. Won by A. Hampton—No. 84	271	1
2nd Prize—Wright's Trophy. Won by Mrs. M. H. Dadley—No. 150	268	—
Section "C" Medium Heavy Breeds.		
1st Prize—Carbarn's Trophy. Won by J. E. Smith (R.I.R.) No. 47	261	8
2nd Prize—J. Goss' Trophy. Won by A. Hampton (Langshan) No. 23	241	25

***First Bird to Lay* 200 *1st Grade Eggs*:**

Section "A" Light Breeds.

Multiple Trophy. Won by R. C. Combs, W. L. No. 42 on January 7th, 1949.

Section "B" Heavy Breeds.

A. & M. Bells Trophy.

Won by V. J. Dadley, Australorp No. 153 on November 10th, 1948.

Section "C" Medium Heavy Breeds.

E. Fry's Trophy.

Won by J. E. Smith, R.I.R. No. 47 on December 8th, 1948.

***Teams of Six Birds Judged for Type by Mr. A. R. Wright*:**

Section "A" Light Breeds.

1st Prize—N. Richard's Trophy. Won by J. E. Smith, White Leghorns, No. 139-144.

2nd Prize—W. Southern's Trophy. Won by R. C. Combs, White Leghorns, No. 37-42.

Section "B" Heavy Breeds.

1st Prize—Harrold & Murray's Trophy. Won by J. E. Smith, Australorps, No. 157-162.

2nd Prize—J. Banfield's Trophy. Won by Mrs. M. H. Dadley, Australorps, No. 145-150.

Section "C" Medium Heavy Breeds.

1st Prize—Milne's and Boan's Trophy. Won by T. Parker, Chinese Langshans, No. 13-18.

2nd Prize—Malloch's Trophy. Won by T. Parker, Chinese Langshans, No. 1-6.

	1st Grade.	2nd Grade.
Team Laying Lowest Percent 2nd Grade Eggs:		
W.A. Egg Marketing Board's Trophy. Won by S. Potter (Australorps)	1183	3

Bird Laying Longest Sequence 1st Grade Eggs:

E. Fry's Trophy. Won by V. J. Dadley, Australorp, No. 153—59 eggs.

Co-Op Trophy:

Section "A" Light Breeds.

Won by J. E. Smith, W.L. 139-144—41 points.

Section "B" Heavy Breeds.

Won by Mrs. F. T. Whitfield, Australorps, 67-72—60½ points.

Section "C" Medium Heavy Breeds.

Won by J. E. Smith, R.I.R. 43-48—45 points.

[*Conditions of Co-op Trophy*—Minimum Lay, 1st Grade Eggs: Section A, 1,100; Section B, 1,200; Section C, 950. At completion of trial each team must be complete, no bird having been replaced during the course of the trial. Teams to be judged on a points system compiled as follows:—

On Arrival—Subtract one point for each 4 ozs. or part thereof under prescribed weight.

At Completion of Trial—Subtract one point for each 4 ozs. or part thereof under prescribed weight. Subtract half a point for each oz. loss of weight. Add half a point for each oz. gain in weight above prescribed weight.]

Gordon's Trophy:

Section "A" Light Breeds.

None qualified.

Section "B" Heavy Breeds.

Won by Mrs. M. H. Dadley, Australorps, Nos. 139-144.

Section "C" Medium Heavy Breeds.

Won by J. E. Smith, R.I.R. Nos. 43-48.

[*Conditions of Gordon's Trophy*—For highest gain in weight. Condition: Must be original team. Minimum Lay—Section A, 1,000; Section B, 1,100; Section C, 850. Must be prescribed weight on arrival. Must maintain weight.]

ANALYSES OF FEEDING STUFFS.

Results of analyses of samples of Feeding Stuffs taken under the Feeding Stuffs Act, 1928-1948.

(Published under section 9 of the Act.)

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime.	Others.	
	W. Angliss & Co. (Aust.), Ltd.	%	%	%	%	%	% CaO	%	%
	" Imperial " Fortified Protein Meal—								
	Registered Analysis	†50·0	*12·0	*2·0	..	...	....	....	....
16-2-49	Sample Analysis	49·8	14·4	3·0	...	.	....	....	....
	Barrow Linton & Co.								
	" Egglayer " Laying Mash—								
	Registered Analysis	†14·0	†3·50	*4·5	*1·0	..	*3·0	....	....
10-3-49	Sample Analysis	18·0	3·9	4·5	1·47	. .	2·72	...	....
	" Chic Chic " Chickgrain—								
	Registered Analysis	†9 0	†2.7	*5.0		....	...	....	....
15-3-49	Sample Analysis	10.9	1.0	4.0			.	..	....
	" Eggoleen "—								
	Registered Analysis	†37 5	*12.0	*1.5			...	.	...
15-3-49	Sample Analysis	38 7	11.4	1.8		.	.	.	..
	" Egglayer " Laying Mash—								
	Reg. Analysis	†14·0	†3·5	*4·5	*1·0	..	*3·0	....	.
23-6-49	Sample Analysis	19·6	5·9	3·7	0·42	...	5·3	....	.
	" Growell " Growing Mash—								
	Reg. Analysis	†14·0	†4·5	*4·5	*1·0	.	*3·0	.	. .
23-6-49	Sample Analysis	18·0	4·8	4·8	0·35	.	4·3	....	.
	Vitalizer Chickstarter—								
	Reg. Analysis	†15·0	†4·0	*4·5	*1·0		*3·0	...	.
23-6-49	Sample Analysis	17·1	3·4	4·4	1·15	..	2·7	...	. .
	" Egglayer " Laying Mash—								
	Registered Analysis	†16·0	†3·5	*4·5	*1·0	.	*3·0	....	....
22-7-49	Sample Analysis	20 5	5·8	4 4	0·34		6·19	...	....
	" Dukko " Fattening Mash—								
	Registered Analysis	†10 0	†4·0	*4 0	*1·0		*3·0	..	....
26-7-49	Sample Analysis	15·2	3·9	4·1	0·32	.	2·41	....	....
	" Growell " Growing Mash—								
	Registered Analysis	†14·0	†4·5	*4 5	*1 0	.	*3·0	...	....
22-7-49	Sample Analysis	20 3	6·8	4·4	0 32	.	5·55	....	....
	" Vitalizer " Chickstarter—								
	Registered Analysis	†15·0	†4·0	*4·5	*1·0	...	*3·0	....	....
22-7-49	Sample Analysis	20 4	5 5	4 2	0 32	..	5·74	....	....
	" Eggoleen "—								
	Registered Analysis	†37 5	*12 0	*1.5	6 0		†4.0	. .	. .
26-7-49	Sample Analysis	38.2	9 9	4.6	6 38		9.14	....	. .
	" Excelsior " Meat and Bone Meal—								
	Registered Analysis	†38.0	*15.0	*1 5			.	.. .	..
26-7-49	Sample Analysis	39.6	11.9	0.4	.			...	..
	W. R. and N. N. Clarke.								
	" Maffco " Dried Buttermilk—								
	Reg. Analysis	†30·0	.	. .	.	. .	....	....	...
18-8-49	Sample Analysis	32·1	.	.	. .	...	....	....	....
	Cuming Smith & Mt. Lyell.								
	" C.S.M.L." Di-Calcic Lick—						CaO		
	Registered Analysis				*38 0	†18.0	†13 0	.	. .
4-4-49	Sample Analysis				39.4	18.4	16.6		...
	Davis Gelatine Co.								
	" Tri Calos " Sterilised Bone Flour—								
	Registered Analysis	†5·0	...	. .	...	†30·0	†40·0	...	....
15-2-49	Sample Analysis	13·7	.	. .	. .	29·4	39·4	....	....
	" Tri Calos " Sterilised Bone Flour—								
	Registered Analysis	†5.0	.. .			†30.0	†40.0	....	....
21-3-49	Sample Analysis	8.31	.			31.0	41.6	....	....
	" Tri Calos " Sterilised Bone Flour—								
	Registered Analysis	†5 0		.		†30 0	†40.0	.. .	
28-7-49	Sample Analysis	7.61		. .		31.5	42.2	....	
	Ferguson's Pty., Ltd.								
	" All-Bone " Bone Meal—								
	Registered Analysis	†18·0	..	..	*0·16	†27·7	†34·97	.. .	....
17-2-49	Sample Analysis	21·	..	.	0·19	26·6	35·4	....	....
	" All Bone " Bone Meal—				less than				
	Registered Analysis	†18.0			1%	†27·0	†34.6		....
9-8-49	Sample Analysis	20.8			0.83	25·4	34.7		...

* Maximum. † Minimum.

ANALYSES OF FEEDING STUFFS.

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime.	Other.	
	David Gray & Co. Pty., Ltd.	%	%	%	%	%	%	%	
	"Western" A1 Laying Mash—						Ca		
	Registered Analysis	†14·0	†3·0	*5·0	...	2·0	0·5	....	....
18-2-49	Sample Analysis	12·8	3·3	3·9	....	1·51	0·38	....	....
	"Western" Chickbuilder—								
	Registered Analysis	†14·0	†4·0	*4·5	2·0	....	0·5	....	....
22-2-49	Sample Analysis	14·5	4·9	3·5	1·84	....	0·42	....	....
	"Western" A1 Laying Mash—								
	Registered Analysis	†14·0	†3·0	*5·0		2·0	0·5	....	....
24-3-49	Sample Analysis	12·6	2·8	4·2	....	1·24	0·52	....	....
	"Western" Calf Food—								
	Registered Analysis	†22·5	†7·0	*5·0	...	2·0	0·5	....	....
31-3-49	Sample Analysis	18·7	4·6	4·1	..	0·88	0·26	....	....
	"Western" Lin Meal—								
	Registered Analysis	†22.5	†7.0	*5.0		..	0.5	....	..
4-4-49	Sample Analysis	22.4	5.8	5.3		.	0.2	..	...
	"Western" Sweet Dairy Food—								
	Registered Analysis	†12.0	†3.0	*10 0			0.5		.
14-6-49	Sample Analysis	10.5	2.5	4.6			0.14		
	"Western" Chickstarter—								
	Reg. Analysis	†14·5	†4·0	*4·5	..	2·00	0·5	....	
14-6-49	Sample Analysis	14·4	3·6	5·0		1·08	0·13	....	
	"Western" Chickstarter—								
	Registered Analysis	†14.0	†4.0	*5.0			*0.8	..	.
9-8-49	Sample Analysis	14.8	4.4	3 4			0.71	..	.
	"Western" Chickbuilder—								
	Registered Analysis	†13.5	†4.0	*5.0			*0.8	.	..
9-8-49	Sample Analysis	14.4	4 5	4.6			0.61	..	..
	J. Kitchen & Sons Pty., Ltd.								
	"Kitchens" Bone and Meat Meal—								
	Registered Analysis	†40·0	*11·0	*2·5		14·0	...	...	..
17-2-49	Sample Analysis	47·8	8·5	0·6	.	14·1	....	...	....
	"Kitchens" Bone and Meat Meal—								
	Registered Analysis	†40 0	*11 0	*2 5		14 0	. .	...	
29-7-49	Sample Analysis	45.5	9.2	0.5		14.0		...	
	Kraft Walker Cheese Co.								
	"Krafco" Dried Whey Powder—						Lactose		
	Registered Analysis	†10.0	†0.5	*Nil*		1.0	0.7	68.0	.
11-8-49	Sample Analysis	13 3	0.6	*Nil*		1.2	1.1	68.0	....
	W. H. Milne & Co.								
	"Millers" laying Mash No. 1—						Ca		
	Registered Analysis	†14·0	†4·0	*5·50	*1·5	*2·0	*3·0	....	....
18-2-49	Sample Analysis	16·0	3·9	4·3	1·26	1·85	2·37	...	....
	"Millers" Chickbuilder—						Ca		
	Registered Analysis	†15.0	†4.0	*5.5	*1.25	*2.0	*2.5	....	...
17-3-49	Sample Analysis	16.7	3.9	5.0	0 98	1.86	1.55	...	...
	"Millers" Chickstarter—								
	Registered Analysis	†15.0	†4.0	*5.5	*1 0	*2.0	*2.5	. .	...
14-6-49	Sample Analysis	17.3	4.5	5.3	1.19	2.20	1.91	.	....
	"Millers" Laying Mash—								
	Registered Analysis	†14·0	†4·0	*5·5	†1·5	*2·0	*3·0	....	....
20-7-49	Sample Analysis	16·5	4·3	5·5	0·76	1·37	1·94	....	....
	"Millers" Chickstarter—								
	Registered Analysis	†15·0	†4·0	*5·5	*1·5	*2·0	*3·0	....	....
20-7-49	Sample Analysis	17·0	4·7	6·0	0·77	2·22	1·85	....	....
	"Millers" Chickbuilder—								
	Registered Analysis	†15.0	†4.0	*5.5	*1.50	*2.0	*3.0	...	.
16-8-49	Sample Analysis	16.1	4.2	6.0	1.53	2.5	3.4	...	....
	W. Thomas & Co. (W.A.), Ltd.								
	"Thomas" Bone Meal—						Cao		
	Registered Analysis	†10.0	..	....	..	†20.0	†25.0	....	....
24-1-49	Sample Analysis	17.0	.	....	...	24.0	31 8	....	....
	"Thomas" Eggmilk—						Ca		
	Registered Analysis	†15.0	†5.0	*4.0	*3.0	....	*15.0	....	....
24-1-49	Sample Analysis	23.3	4.0	2.0	3.66	....	4.87	....	....
	"Thomas" Egg Protein—								
	Registered Analysis	†42.0	*15.0	*4.5	*8.5	....	*15.0	....	....
24-1-49	Sample Analysis	44.6	12.6	0.7	7.0	....	8.0	....	....
	"Thomas" Fattening Mash—								
	Registered Analysis	†10.0	†2.0	*6.5	*1.25	....	*3.75	....	....
25-1-49	Sample Analysis	12.6	2.4	5.2	1.61	....	1.40	....	....
	"C" Meal Wheaten Meal—								
	Registered Analysis	†8.0	....	*9.0	....	.. .	....	....	....
25-1-49	Sample Analysis	10.8	....	2.14	. .	...	....	....	....

* Maximum † Minimum

ANALYSES OF FEEDING STUFFS.

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime.	Others.	
	W. Thomas & Co. (W.A.), Ltd.—*continued.*	%	%	%	%	%	%	%	%
	" Thomas " Quickgrow—						Ca		
	Registered Analysis	†25·0	*19·0	*2·60	*2·75	....	*15·0	....	....
18-2-49	Sample Analysis	34·5	9·8	1·0	6·67	...	13·6	....	...
	" Thomas " Laying Mash No. 1—								
	Registered Analysis	†14 0	†2.5	*6 0	*1 5	.	*3.75		.
22-2-49	Sample Analysis ...	14.8	3.8	6.6	1.46		2.35	.	.
	" Thomas " Quicklay—								
	Registered Analysis .	†35·0	*12·5	*4·0	*3·0	.	*15·0	....	....
10-3-49	Sample Analysis	40·8	12·1	4·0	6·3	.	12·8	....	....
	" Thomas " Chickstarter—								
	Registered Analysis . .	†14.5	†2.5	*6.0	*1.25	....	*3.75	....	....
16-3-49	Sample Analysis .	17.2	2.9	6.8	1.07		1.64	....	....
	" Thomas " Special Laying Mash—								
	Registered Analysis	†13.5	†3.0	*7.5	*1.5	...	*3.75	....	....
16-3-49	Sample Analysis	15.3	2.2	5.3	1.52		1.86	....	....
	" Thomas " Laying Mash No. 1—								
	Registered Analysis . .	*16·0	*2·5	†6·0	†1·5	..	†3·75	....	....
24-3-49	Sample Analysis . .	19·9	5·2	5·8	1·56	. .	2·83	....	....
	" Thomas " Chickgrower—								
	Registered Analysis	†13.5	†2.5	*6.0	*1.25	.	*3.75	..	. .
2-6-49	Sample Analysis	17.1	3.4	6.7	1.30		2 62	.	.
	" Thomas " Calf Food—								
	Registered Analysis .	†15.5	†2.5	*6 5	*3.0		*15.0	. ..	..
2-6-49	Sample Analysis	23.1	2.2	9.9	2 0		2.44	. .	. .
	" Thomas " Sweet Dairy Food—								
	Registered Analysis	†11 5	†1 5	*8 5	*1 75		*4.0	.	....
14-6-49	Sample Analysis	13.8	3 7	6.6	1 8		1 94	.	. ..
	" Thomas " Calf Milk—								
	Reg. Analysis	†13·5	†2·5	*6·0	*1·25	...	*10·0	....	....
22-6-49	Sample Analysis . . .	21·7	4·0	4·5	1·96	.	2·8	. ..	....
	" Thomas " Quickgrow—								
	Reg. Analysis ..	†25·0	*19·0	*2·0	*2·75	..	*15·0	. ..	....
22-6-49	Sample Analysis .. .	34·2	9·9	1 8	4·65	. .	13·3	.	....
	" Thomas " Chickgrower—								
	Registered Analysis .	†14.5	†2 5	*6.0	*1.25		*3.75	....	. ..
27-7-49	Sample Analysis .	16.8	3.4	6.2	0.76		2.41	....	....
	" Thomas " Chickstarter—								
	Registered Analysis	†18 0	†2 5	*6 0	*1.0	.	*3 75	....	...
27-7-49	Sample Analysis	20.6	4 2	5.6	1.42		1.86	....	...
	" Thomas " Laying Mash No. 1—								
	Registered Analysis	†16.0	†2.5	*6 0	*1 5		*3 75	. ..	. .
27-7-49	Sample Analysis . .	17.2	3.4	4.6	1.22	.	3.69	...	.
	" Thomas " Quicklay—								
	Registered Analysis ..	†35.0	*12 5	*4 0	*6.0		*15.0	...	.. .
28-7-49	Sample Analysis ..	38.8	8.4	1.2	1.84		11.2	....	....
	" Thomas " Special Laying Mash—								
	Reg. Analysis	†14·0	†2·5	*7·0	*1·5	...	*3·75	. .	...
17-8-49	Sample Analysis	16·6	4·2	7·0	1·4		3·44	...	....
	" Thomas " Chicken Grain—								
	Reg. Analysis	†9·0	†1·5	*4·5	.	.	....	....	....
17-8-49	Sample Analysis	9·2	1·6	2·0	. .	..	....	....	....
	" Thomas " Eggmilk—								
	Reg. Analysis	†18·0	†5·0	*4·0	*3·5	.	*15·0	.	....
18-8-49	Sample Analysis	21·1	2·3	5·1	3·3	.	8·6	. .	....
	Tropical Traders, Ltd.								
	" Evelyn " Horse Food—							Sulphur	
	Registered Analysis	†12·6	†5·7	*7·14	*6·0	0·9	1·1	*1·84	....
21-2-49	Sample Analysis .	13·0	2·3	3·7	6·54	0·60	0·86	1·44	....
	Evelyn Calf Food—								
	Reg. Analysis	†8·5	†3·0	*3·86	*3·5	. .	....	*3·5	...
18-8-49	Sample Analysis	8·7	1·6	3·0	2·7	. .	....	1·5	....
	W.A. Meat Export Works.								
	" W.A.M.E." Bonemeal—						CaO		
	Registered Analysis .	†18.75	. .		*0.25	†26.0	†27.0	....	..
18-3-49	Sample Analysis .	25.6	. ..	....	0 15	25.5	33.5	....	....
	" W.A.M.E." Meatmeal—								
	Registered Analysis ...	†45.0	*13.0	*2.0	.		...	....	....
18-3-49	Sample Analysis	49.9	11.5	1.5	.	. .	.	....	....
	W.A.M.E. Bone Meal—						CaO		
	Registered Analysis ...	†18.75	.	.	*0.25	†26.0	†27.0	.	. .
28-7-49	Sample Analysis	23.6		. .	0.15	24.9	32.8		..

* Maximum. † Minimum.

ANALYSES OF FEEDING STUFFS.

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime.	Others.	
	Westralian Farmers Co-op., Ltd.								
	Wesfarmers Laying Mash No. 2—						Ca		
	Registered Analysis ..	†11.0	†3.0	*7.0	0.5	..	0.8	....	....
25-1-49	Sample Analysis ..	12.0	2.2	4.3	0.47	..	0.63	...	....
	" Wesfarmers " Chick Mash " A "—								
	Registered Analysis ...	†15.0	†4.0	*7.0	..		0.3	....	....
26-1-49	Sample Analysis .	18.3	5.1	5.0	..	..	1.22	....	...
	" Wesfarmers " Laying Mash No. 1—								
	Registered Analysis .	†14·0	†4·0	*7·0	0·5	....	1·0	....	....
21-2-49	Sample Analysis	14·0	2·6	4·0	0·85	....	2·16	....	....
	" Wesfarmers " Growers Mash—								
	Registered Analysis ...	†13·0	†4·0	*7·5	0·5	...	0·7	....	....
23-2-49	Sample Analysis	13·0	3·0	4·4	0·62	...	1·37	....	....
	" Red Comb " Growers Pellets—								
	Registered Analysis .	†13.0	†4.0	*7.5	0 5	.	0.7	...	...
17-3-49	Sample Analysis ..	13.7	3.0	4.4	0.6	..	1.93	..	..
	" Wesfarmers " Laying Mash No. 1—								
	Registered Analysis	†14.0	†4.0	*7.0	0.5	...	1.0	....	..
18-3-49	Sample Analysis . .	12.3	1.8	4.0	0.6	....	1.39	..	...
	Wesfarmers Chick Mash " A "—								
	Reg. Analysis	†15·0	†4·0	*7·0	..	..	0·3	.	.
15-6-49	Sample Analysis	15·1	4·1	4·3	..	...	1·2	...	...
	Red Comb Laying Pellets No. 1—								
	Reg. Analysis	†14·0	†4·0	*7·0	0·5	.	0·8	...	....
15-6-49	Sample Analysis ..	12·6	3·0	4·9	0·8	...	1·9	..	....
	" Red Comb " Laying Pellets No. 1—								
	Registered Analysis .	†14·0	†4·0	*7·0	*1·0	...	*1·0	....	....
20-7-49	Sample Analysis .	12·5	3·2	4·3	0·27	....	1·58	....	....
	" Wesfarmers " Laying Mash—No. 1—								
	Registered Analysis	†14·0	†4·0	*7·0	*1·0	....	*1·0	....	....
20-7-49	Sample Analysis . ..	12·4	3·2	4·2	1·05	..	1·56	...	....
	Wesfarmers " Growers Mash—								
	Reg. Analysis	†13·0	†4·0	*7·5	*1·0	...	*1·0		.
18-8-49	Sample Analysis . .	13·9	3·4	5·1	0·95	...	1·1		..
	" Red Comb " Growers Pellets—								
	Reg. Analysis	†13·0	†4·0	*7·5	*1·0	....	*1·0		..
17-8-49	Sample Analysis	13·9	3·9	4·8	0·37	....	1·73		..
	Wrights Ltd.								
	' Pannifex " Poultry Pusher—								
	Registered Analysis .	†32·0	†7·0	*8·0	...	....	....	....	....
23-2-49	Sample Analysis	36·5	10·6	7·2	....	....	....	....	....
	" Pannifex " Mormilk No. 2—								
	Registered Analysis	†20·0	†4·75	*14·0	....	....	....	..	....
1-4-49	Sample Analysis . ..	23·2	5·5	10·6	...	....	....	....	....
	Robert B. Young.								
	"Morlay" Laying Mash "B"—								
	Registered Analysis . .	†11·5	†3·0	*6·0	*1·5	*4·0	†2·0	....	....
17-2-49	Sample Analysis	13·0	2·8	3·3	0·95	3·92	4·59	...	....
	" Morlay " Growing Allmash—								
	Registered Analysis	†12 0	†3.0	*6.0	*1.5	*4.0	†2.5	..	..
14-3-49	Sample Analysis . . .	14.0	3.0	3.2	1.07	3.9	4.17	..	..
	" Morlay " Laying Mash—								
	Registered Analysis . .	†14.0	†3.0	*5.5	*1.5	*3.5	†2.5	....	..
14-3-49	Sample Analysis	13.8	2.6	3.0	0.91	3.58	3·76	..	...
	" Morlay " Laying Allmash—								
	Registered Analysis	13·0	3·0	†6·0	†1·5	†4·0	†2·5	....	....
31-3-49	Sample Analysis	12·8	3·3	3·6	1·47	3·83	5·02	....	....
	" Morlay " Laying Mash—								
	Registered Analysis	*14·0	*3·0	†5·5	†2·0	....	†4·0	....	....
21-7-49	Sample Analysis	15·3	4·4	4·2	0·40	....	2·90	....	....
	" Morlay " Chickstarter—								
	Registered Analysis	*15·0	*3·0	†5·5	†1·75	....	†4·0	....	....
21-7-49	Sample Analysis	15·7	3·5	3·4	0·78	....	6·36	....	....
	" Morlay " Laying Mash—								
	Reg. Analysis	†14·0	†3·0	*5·5	*2·0	....	*4·0	....	....
17-8-49	Sample Analysis	16·0	5·1	5·3	1·90	....	2·81	....	....
	Red Comb Chick Pellets A—								
	Registered Analysis ...	†15.0	†4.0	*7.0	....	...	...	...	..
16-8-49	Sample Analysis	15.3	5.1	5.3	....	...	....	....	....
	Red Comb Chick Pellets B—								
	Registered Analysis . .	†14.0	†4.0	*7.0	*1.0	...	*1.0	....	....
16-8-49	Sample Analysis	14.4	4.1	4.8	0.81	....	1.2	....	....
	Red Comb Laying Pellets No. 1—								
	Registered Analysis .	†14.0	†4.0	*7.0	*1.0	....	*1.0	....	...
16-8-49	Sample Analysis	12.6	4.0	4.9	0.74	...	1.7	....	....

* Maximum. † Minimum.

By Authority: William H. Wyatt, Government Printer, Perth.

A CALENDAR OF FARMING OPERATIONS FOR CEREALS AND SHEEP IN THE WESTERN AUSTRALIAN WHEAT BELT (12 IN.—25 IN. ANNUAL RAINFALL.

Month.	Cereals.		Sheep.		Pastures.	
	Operations.	Recommendations.	Operations.	Recommendations.	Operations	Recommendations
January	Completion of Harvesting	Clean and store machinery, and list parts required. Overhaul tractor and other machinery	Feed and water	Sheep to stubbles—best grazing for mated ewes and weaners. Be sure water supplies plentiful and good	....	Do not overgraze and so encourage conditions for soil erosion.
February	Seed grading and pickling	Seed should be well graded. Oats and barley dry-pickled with organic mercury dust. Wheat dry-pickled with copper compounds for control of stinking smut. Renovation of machinery for cultivation and seeding.	As for January	Regular inspection—hand feeding may need to start—grain for ewes—hay (cereal or meadow) for dry sheep—remove rams at end of month	Topdressing	At least ½ cwt. of superphosphate to old pastures previously topdressed for over 10 years and up to 1½ cwt. for those on relatively new land.
March	Planting early feed crops	Plant catch crops (oats, barley) on stubble or pasture land to provide early grazing	Hand-feeding	Probably now required for all sheep. Grain up to ¼ lb. per head per day for mated ewes (steaming up), plus some hay as paddock roughage becomes depleted. Grain prevents losses from pregnancy toxaemia of ewes and is also advantageous for weaners. Hay generally sufficient for other sheep. Watch water supplies	Topdressing and renovation	Finish topdressing. Plant catch crops and renovation crops of oats on clover land.
April	Fallow preparation and early cropping	Cultivate fallow after rain has germinated weed seeds. Early green feed crops on fallow may be sown, also midseason and late wheat varieties according to district if conditions suitable	Hand feeding. Crutching. Inoculation. Mules operation	Hand feeding may still be necessary—important for for mated ewes. Crutching minimises fly trouble and reduces amount of daggy wool at shearing. Enterotoxaemia (Braxylike disease) can be prevented by inoculation (April, May, June). This can be conveniently done during crutching operations. Also suitable time for "mules" operation for prevention of fly strike.	Pasture establishment and management of old pastures	New clover pastures generally do best when sown early. Use good seed and liberal superphosphate. Inoculate seed particularly on new or relatively new land. Old pastures should not be grazed during first few weeks till well rooted. Hand feeding will avoid this.
May	The main seeding month	Sow varieties according to maturity and suitability to the particular district. Too early sowing of early varieties may result in septeria or frost injury in spring. Best results obtained when seeding takes place in moist well consolidated seed bed following destruction of early germinated weeds. Use early and very early varieties according to district when conditions cause seeding to be extended later than normal. Apply superphosphate at rates recommended for local conditions.	Lambing. Tailing and marking	Provide good nutritive conditions for lambing ewes—grain essential if green pastures or early crops not available. Lambing paddocks should contain shelter belts. Inspect ewes frequently. Lamb marking should be carried out on a warm dry day—avoid placing lambs after operation on rank, wet grazing. Use sharp instruments, antiseptics and for preference temporary yards. The long tail (3 in.) reduces fly strike. Lay poison baits for foxes and dogs prior to and during lambing period	General management and grazing	Avoid overgrazing just after germination, except paddocks intended for ploughing up and cropping.
June	Cropping completed	Seeding of wheat crops on pasture land should be delayed at least two weeks after ploughing to avoid web worm damage. Clean and store seeding machinery—list new parts required	Lambing, tailing and marking generally completed	Similar to May and according to season. Watch for fly strike—early flush seasons may produce an early winter fly wave	General grazing management	Rotate grazing—pastures can become "fouled" and stale—stock do better on fresh grazing and frequent changes. Fumigate and destroy rabbit warrens during winter months
	Fallowing	Early fallow is better than late fallow in drier areas. Thoroughness of the job more important than the type of machine. Wash superphosphate bags				
July	Fallowing and general renovation	Inspect crops—farms can frequently be kept free of noxious weeds or objectionable weeds by hand pulling, hoeing, etc., before they reach serious proportions. On wet days renovate machinery, buildings, equipment. Classify bag supply—make bundles each 2 dozen of super. bags for refilling	Preparation for shearing	Prepare yards, shed and gear for shearing—order wool packs, branding fluid, raddle, etc.	General grazing management	Select and shut up paddocks for meadow hay.
			Culling	Class and cull your sheep before shearing. This can make drafting and wool classing easier at shearing time. Book ram requirements		
August	Various	Early fallow may require cultivation or ploughing back to destroy weeds or restore tilth if set hard. Prepare hay cutting machinery. Decide grain and fodder requirements for fodder conservation	As for July	Shearing commences in early districts, brand all sheep with registered wool brand and recommended fluid—clean up shed, store machinery and list new parts required. Market early fat lambs	As for July	Most pastures can be grazed heavily at this time of the year but frequent changes are desirable. Give the best grazing to ewes and lambs.
September	Attention to fallow and haycutting	Fallow should only be worked if required—over cultivation encourages erosion, particularly on lighter soils. Cereal hay cutting should be completed not later than two weeks after full flowering. Plough fire breaks	Main shearing. Marketing fat lambs. Weaning	Skirt, roll and class the wool to make even lines—use recommended abbreviated terms to describe wool—bale and press wool stencil on bale (3 in lettering) "Property," abbreviated description of contents and number of bale (see Department leaflets). Book killing space at export works for fat lambs—handle carefully to avoid bruising. Well grown lambs (except those intended for export) can be weaned at shearing time	Hay making in early districts	Meadow hay should be cut when the bulk of the pasture is in full flower, subterranean clover when just beginning to wilt. Plough fire breaks.
October	Hay making and stacking	Hay deteriorates when exposed to sun and rain. Cart as soon as sufficiently dry to stack. Make large stooks if hay carting and stacking is likely to be delayed. Arrange for wheat carting	Shearing completed (late districts). Preparations for mating. Dipping	Weaners should be placed on good grazing. Class the ewe flock—culls to market or suitable feed for fattening. Ewes intended for mating to relatively poor grazing so that they do not become overfat. Very fat ewes are difficult to "flush" and may not conceive. Dipping to control lice and tick is compulsory and should be carried out 3 to 6 weeks after shearing with an approved dipping preparation and according to directions. Drench for the control of worms	Hay making (early districts)	These operations should be completed as quickly as possible—undue exposure to weather causes unnecessary mechanical loss of valubale leafy parts and also food nutrients, including green colouring matter (source of Vitamin A). Less total loss with baled hay than stacked. Power mowers, side delivery rakes and pick-up baler enables this work to be done expeditiously with a minimum loss and the material baled direct from the winrows.
November	Hay carting completed. Grain harvesting in early districts	Stud seed plots or areas selected for next season's seed should be carefully harvested to avoid admixture. Order superphosphate requirements for cropping and pastures for following years	Early mating	Ewes should be "flushed" on good feed for three weeks prior to and during mating. A "scratched-in" crop of oats which has been used for winter grazing and allowed to recover is very suitable for "flushing." Ballidu and Fulghum are good recovery varieties. At least 2 per cent. of rams should be used with pure Merinos and 3 per cent. for fat lamb production where a concentrated lambing is desired. Preventive inoculation for toxic paralysis should be done about this period if the disease is feared	.. ..	Wimmera rye grass remains greener longer than most annual species. Avoid over grazing so that this plant has an opportunity to set seed.
December	Harvesting completed in most districts	Cut straw and thatch hay stacks. Reserve additional supplies of seed of early wheat varieties in case the the following season opens late	Main mating	Merino and Dorset Horn ewes will mate in November but most crossbreds not till December. Other British pure breeds do not come in season till January-February	....	Stubbles also become grazing paddocks after harvesting completed. Check fire fight-equipment. Rabbit poisoning with phosphorus baits during summer months.